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Mine

THE COPPER HANDBOOK

A MANUAL OF THE COPPER INDUSTRY OF THE WORLD

VOL. IV

FOR THE YEAR 1903

COMPILED AND PUBLISHED BY
HORACE J. STEVENS
HOUGHTON, MICHIGAN, U. S. A.
1904

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Following the text of the book is an advertising section of 100 pages, carrying the announcements and cards of nearly two hundred manufacturers, dealers in mining supplies, mining companies, engineers, metallurgists, chemists, trade journals, railroads, etc., supplemented by a carefully compiled classified buyers' index.

PREFACE.

The present annual edition of the Copper Handbook, which is the fourth, will be found more complete than its predecessors, in a variety of ways. The statistical tables have been revised and brought to the close of 1903 in most cases, and as near thereto as the data available has allowed in all other instances. The longest chapter of the book, which is devoted to detailed descriptions of the large number of 3,311 copper mines and copper mining companies, in all parts of the world, has been rewritten throughout, with great care, and the revision has been so thorough that it is doubtful if there are a half dozen descriptions remaining unchanged from the preceding edition. Not only has the number of mines and mining companies been increased by exactly half, but the descriptions of all of the producing mines of importance have been greatly amplified, all of the old matter of importance being retained, and incorporated with the new material in logical order. The work of revising the statistical and descriptive chapters has proven so arduous, however, that it has been found impossible to revise the technological chapters, unless the issue of the work were delayed several months past the customary time for its appearance, which was deemed unwise. The work of revising the preliminary chapters of the work will be taken in hand at once, for the 1905 edition, a very large mass of material having been collected for this purpose.

men of assured standing, and a considerable volume of general advertising somewhat less directly connected with the copper industry. A number of advertisements offered for this work have been refused, the greater part of these being of copper mining companies of shady standing, as to publish the advertising announcements of mining companies reported upon unfavorably in the text of the book would be a self-evident stultification.

HORACE J. STEVENS.

Houghton, Michigan, U. S. A., March 17, 1904.

THE COPPER HANDBOOK

CHAPTER I.

THE HISTORY OF COPPER.

The discovery and utilization of copper occurred at a period so remote that even legendary accounts are lacking. A semi-authentic narration of the facts connected with the discovery of iron on Mount Ida has been handed down to us, yet there were copper mines worked on this same mountain in Asia Minor before the alleged date of the discovery of iron. The earlier history of the useful metal is surrounded by the same myths as cloud the story of mankind in general in days so far remote. There seems good reason to think that copper and tin, in the form of bronze, an alloy of these two metals, was in general use before the discovery of the process of producing iron from its ores. Such was unquestionably the case with the primitive peoples of Northern and Western Europe. In Asia Minor, the scene of the earliest civilization known to archæologists, many weapons, implements and ornaments of bronze have been found in buried cities of seven to eight thousand years of age. On the American continent the aboriginal peoples were unacquainted with the use of iron, but the richer and more advanced nations had great stores of copper, gold and silver. The latter metals, found in profusion in Mexico and Peru, were utilized mainly for ornaments and decorative architecture. There being no important tin deposits as yet developed in the new world, and there being no evidence that tin was mined on the North and South American continents before their discovery by Europeans, it seems altogether probable that the aboriginal American aces were totally unacquainted with bronze and brass. However, copper itself was used extensively. It was mined from Lake Superior deposits of native metal in very considerable quantities, and was distributed at least as far south as Mexico, and to practically all parts of the territory now constituting the United States. The date at which this mining was done is variously estimated at some hundreds to many thousands of years ago. The Chippewa Indians were in possession of the southern shore of Lake Superior when it was visited by the first white explorers, the intrepid Jesuit missionaries, Rene Mesnard and Claude Allouez, early in the Seventeenth century; Father Mesnard, the first white man to set foot on the shore of the great fresh water sea, having lost his life a few miles from where the greatest copper mines of Lake Superior are now developed. The Chippewas were then unacquainted with any of the practical uses of copper, though possessing a few small masses of the native metal, saved apparently for the same reason that impels a child to collect bright colored bits of broken glass. The Indians not only made no practical use of copper, but were unacquainted with the use of any other metal. As extensive mining operations were formerly carried on in the district held by the Chippewas in the middle of the Seventeenth century, the last actual mining must have been done at least several hundred years earlier, or some oral traditions would have been handed down. Whether the mining was done by ancestors of the aboriginal tribes discovered in possession of the Lake district by the earliest white explorers, or by some antecedent people of higher civilization, is a point that archæologists and ethnologists are still arguing. Whatever may have been the derivation or fate of that pre-historic race of copper miners, vaguely termed "Mound Builders," it is certain that they enjoyed at least a rudimentary civilization, and were successful metallurgists, for they possessed the art of tempering copper. Weapons for the chase and war and domestic utensils of good finish and style, and highly tempered, are dug from mounds and found in sand dunes along the southern shore of Lake Superior from time to time. In this connection, it may be observed that many zealous metallurgists, mostly of the amateur stripe, are wasting much time in efforts to re-discover the "lost art" of tempering copper. Sundry fairly successful processes for tempering copper are now known to scientists, but the art, even if again brought to its pristine perfection, would be of no great benefit, as steel and iron are much cheaper than copper, and far preferable for any ordinary use to which tempered copper could be put.

From the earliest dawn of history, copper and gold seem to have been in common use among the more civilized nations, the yellow metal for ornaments and as a medium of exchange, and the ruddier one for weapons and implements, usually in the form of an alloy, as brass or bronze. The ancient world of Grecian and Roman days possessed considerable stores of copper, and mines were regularly worked. There are apparently good reasons for believing that the Phœnicians knew of the tin and copper deposits of Britain at a period as remote as 1,000 B. C. Spain was the source of the principal copper supplies of the Roman empire, although other fields were also worked to some extent. Spain has been furnishing copper to the world for nearly three thousand years, and remains one of the principal sources of the world's copper supply.

During the dark period of the middle ages, mining, while not a lost art, was certainly not followed as systematically and successfully as during the more prosperous and enlightened era of Roman dominion. The world's supply of gold and silver decreased from century to century, owing to the losses from attrition and misplacement not being made good by the quantities mined. Iron, being subject to rust, was mined and smelted as required, although the production was surprisingly small. It is probable that the

United States Steel Corporation now turns out in every working day more iron than was produced in all Europe in a full year, at the period of greatest darkness during mediæval times. The supply of copper during the middle ages must have been very small, but the science of statistics was not then in vogue, in a period when a king was called Beauclerc—good clerk—because he could write his own name without the guiding hand of a monk.

When Europe awoke from the lethargy and sodden life of the dark ages, in the Fifteenth century, the use of the metals began growing, and this growth has continued, with few interruptions, to the present day. The tin and copper mines of Cornwall became sources of great wealth to their titled owners, and the mining of copper was stimulated in Germany, Norway and other European countries. In the Eighteenth century copper mining was started in the American colonies of Vermont and New Jersey. In the Sixteenth century copper was discovered in Mexico and several parts of South America, but the Spanish conquistadors were more anxious for the gold of the Peruvian Incas, and the silver from San Louis Potosi, than for the cheaper metals.

At the beginning of the Eighteenth century the English mines, in Cornwall, were making much the largest part of the world's copper, and even at that date were of such considerable depth and with such extensive underground openings that the problem of disposing of the water was of the most vital importance. Many good mines were allowed to remain idle, solely because the expense of keeping them free of water was greater than the profits of operation. The first steam engine was built for a Cornish mine, the Wheal Por, by a Captain Savery, very early in the Eighteenth century. It was but a partial success, and the plan was improved on by Newcomen, who erected a pumping engine at the Wheal Fortune mine, Cornwall, in 1720. The Newcomen steam engine was a crude and wasteful device, according to the standard of the present day, but it was much more effective than hand and horse power, or a water wheel, and was used in many of the larger Cornish mines for fifty years or more, until the genius of Watt brought forth the modern steam engine—an engine that a century and a quarter has been unable to improve upon in essential plan, though many and great betterments have been made in details. It should be said, however, for Savery and Newcomen, that crude as were their steam engines, the pumping plan followed by them was essentially sound, and the Cornish pump, first made by Savery nearly two hundred years ago, and improved a little later by Newcomen, is still the basic model for the Cornish mine pumps, scattered over the habitable world, wherever there are mines.

The first Watts engine was erected at Chacewater, Cornwall, in 1777, and proved a great success. It came none too soon, as the larger mines, deepened by reason of the aid given from Newcomen's pumps, were at a depth where the first crude engines could no longer give satisfactory results.

Although steam power was first applied to copper mining nearly two centuries ago, it was used only for handling water until after the beginning of the Nineteenth century. The first application of steam power to other mining uses was in the first or second decade of the Nineteenth century, when a hoisting drum was first actuated by steam.

At the beginning of the Eighteenth century Great Britain was making at least three-quarters of the world's copper. The Cornish mines produced 4,923 tons of refined copper in 1799, and the Welsh mines of Anglesea made nearly 2,000 tons in the same year. The great Mansfeld mine, in Germany, made only 372 tons in that year, and only estimates are obtainable for the products of other countries. Spain's output was insignificant, and the United States made but a few tons. Russia and Japan probably ranked next in importance after England as producers, and Austria, Norway, Sweden, Italy and several other nations made small contributions to the world's copper stock. Australia, South Africa and Canada were then unknown as sources of copper supply. It is a notable fact that one hundred years ago, the mines of the United States, Spain, Chile, Mexico, Canada, South Africa, Australia and Tasmania, which now make about 90 per cent. of the world's copper, were either totally undeveloped, or else producers of but a few tons each, while Great Britain, which made almost 7,000 tons of copper in 1799, produced but 550 tons in 1899.

For the first half of the Nineteenth century, Great Britain maintained its position at the head of the world's copper producers, but the latter half of the century was a period of ever increasing depression, relieved by only occasional years of prosperity for the British copper mines. The invention of the Watts engine and its application to pumping machinery enabled the mine operators of Cornwall and Anglesea to penetrate to depths theretofore undreamed of. In 1790 the Dolcoath mine in Cornwall was 600 feet deep; in 1816 it was down 1,368 feet, and in 1830 the Tresavean mine, also of Cornwall, reached the great depth of 1,920 feet. As the mines increased in depth rapidly, various improvements became necessary. The old method of raising ore in baskets carried up ladders on the backs of men and women was replaced by whims, operated first by hand, then by horse power, later by water wheels, and eventually by steam. Around these whims were coiled the ropes that hoisted ore in wicker baskets. A little later the hempen ropes were replaced by wire cables, and the baskets gave way to iron skips and cages. In 1842 the first man engine was built, for taking men to and from their work in the deep mines. Mine surveying was introduced, and machinery employed in the mills, where hand work had been the rule for centuries. The Anglesea mines enjoyed great prosperity for the first quarter of the century, but gave unmistakable signs of exhaustion a few years later, and in the fourth decade ceased to be important factors in the world's copper industry. The smelters of Wales had attained such growth, however, that Swansea still remains the seat of one of the greatest and most diversified smelting industries of the world.

It was in the fourth decade of the last century that the competitors destined to destroy the English copper mining industry first began coming to notice. The copper discoveries in the Lake Superior district were made at about the same time as copper in workable quantities was found and Colorado still makes its copper as a by-product from the mining of gold, silver, zinc and lead ores. New Mexico has not become the large producer so frequently predicted, though possessing copper deposits of more than average promise.

Alaska, from which have come such great tales of cupriferous wealth, will become a regular copper producer in 1904, but the metal will be made, not from the interior mines, about which so many lies have been told, despite their undoubted richness, but from the ores of Prince of Wales Island, on which there are several properties that promise to make rich mines.

In the eastern and southern states the Tennessee Copper Company is the only producer of real importance, and the results secured at that property prove that profitable mines can be developed in the Appalachians. There is more or less work under way in North Carolina and Virginia, where some good mines should be opened in time, and a little work is in progress in Vermont also.

In Canada the Boundary district leads in production and importance. The development of paying mines on the enormous low-grade deposits of this district proves the field of great importance. There are richer ores along the Pacific coast, where considerable work is in progress. In eastern Canada the Sudbury field is rather quiet, and the production of Quebec, Nova Scotia and New Brunswick is insignificant. Newfoundland remains practically stationary so far as production is concerned, but may show an increase soon.

In Mexico there are copper mining developments of vast importance. Mexico is now making more copper than any other country except the United States, having passed Spain in production. The Greene Consolidated and Boleo remains the principal mines, but there are a dozen others of importance, in process of development. . Sonora, lying just south of Arizona, is an especially promising field.

El Cobre mines, in Cuba, are being reopened by a strong American company. These mines were large producers during the Nineteenth Century, up to 1868, when wrecked by a revolution.

The Chilean mines are not gaining in production as rapidly as had been hoped. The reopening of the Cerro de Pasco mines of Peru on a modern scale is the most important mining work now under way in South America. Bolivia's production remains practically stationary. Important developments are in progress in the Mexicana district of Argentina. The unsettled political conditions in Venezuela and Colombia prevent the development of properties know to be of great promise.

The Hispano-Portugese mines show a slight falling off in production, due mainly to the partial exhaustion of several old mines that have been large and steady producers for many years. The copper resources of Spain are so enormous that an increase in output is but a matter of time. German copper production shows small change. Italy and Russia continue to produce without marked gain. Norway shows a substantial increase, and, next to Spain, is perhaps the most promising European copper field.

In Asia the copper production is insignificant, outside of Japan, which continues to increase its output. The Japanese mine-owners have expended large sums in betterments during the past few years, and now have better mining and smelting equipments than ever before. China has some important copper measures, worked in a small way, and in time the Chinese empire should become a highly important producer of the red metal.

In Africa the only producing mines of importance are in Little Namaqualand, Cape Colony, and these are decreasing in output. There are developments of the utmost promise under way in the interior of Africa, especially in Rhodesia, and along the coast of German Southwest Africa. While these mines, in a new country, cannot become producing factors of importance for some years, they are reasonably certain to take high rank in time.

In Australasia the Mt. Lyell mine of Tasmania remains the largest producer. There is considerable activity, however, in several states of Australia, more especially in New South Wales and Queensland. The copper resources of Australia are enormous, and if that commonwealth can be cured of its crazy socialistic notions, good progress can be made.

The era of copper manipulation, beginning in 1899 and ending early in 1902, was marked by unnaturally high prices, greatly restricting consumption, followed by abnormally low figures that caused the speedy absorption of the large surplus of metal stored up by reason of unduly high prices. The course of the metal market during 1903 was more regular and more free from manipulation than since 1898, but the suspicions of purchasers remain active. Having suffered from previous interference with the law of supply and demand in the copper market, it is but natural that they should fear further tactics of the same sort, and weigh the evidence at hand quite closely, before making market commitments.

The best interests of producers and consumers alike will be served by a perfectly natural market, in which the level of prices is determined by the supplies on hand and the consumptive capacity of purchasers. Copper consumers are prone to think that the abnormally high prices of 1899-1901 were secured solely at their own cost, yet as a matter of fact the producers suffered also, to no small extent, from the selfsame inflation. By reason of the unduly high prices then ruling, many new mines were opened, to compete with those already developed, and their competition, brought about by the era of high prices, became effectual after prices had dropped sadly. Not only this, but the cost of producing copper advanced materially by reason of the high market price. Costs were increased, not only through higher wages paid workmen, but by reason of a general slackening of vigilance in guarding small leaks, it seeming impossible for any corporation to be as careful in good times as in an ordinary season. It has taken the better mines several years to get back, even partially, to the vantage ground of costs occupied before the era of boom prices that began in 1898.

CHAPTER II.

THE GEOLOGY OF COPPER.

In this chapter no attempt is made to give more than the merest outline of the geological features of special interest, pertaining to copper. Geology is, at best, largely an empirical science. From its very nature it can never be made such an exact science as chemistry and mineralogy have already become. This is said in no carping spirit of criticism against the exponents of scientific geology, for their work is of a highly valuable nature, and if the geological dogmas of the present day contain a greater amount of assumption in proportion to ascertained and demonstrable fact than is found in cognate branches of scientific research, the empirical nature of a considerable part of the geology taught at the beginning of the Twentieth century is due to the inherent difficulties of the subject, rather than to any desire of geologists as a whole to assume more than can be proven. Just as a forest of scaffolding is erected around the walls of a great cathedral, while building is in process, so a false-work of theory is indispensable in geological research. Behind the great mass of temporary timbering the granite walls of truth are rising, slowly but surely, and as they rise, the scaffolding that once was necessary becomes useless, and is discarded.

Rocks are divided into three geological classes, the igneous, sedimentary and metamorphic. The igneous rocks, fused by subterranean fires and ejected in sheets by volcanic action, or oozing forth from cracks in the earth's crust, may be divided into granitic, porphyritic and vitreous forms. The sedimentary rocks were deposited by the action of water, usually on beds of former seas. The detrital material so deposited formed conglomerate, shale, sandstone and limestone strata, and in the case of the three first named, the material for sedimentary beds was necessarily obtained principally from the breaking down of the older igneous rocks. Strata of igneous and sedimentary rocks frequently alternate in the older geological groups. The metamorphic or third class, consists of altered rocks of the igneous and sedimentary forms, in which the phenomena of crystallization and replacement have been brought about subsequent to their deposition.

The Devonian system of the Paleozoic group was long regarded as the home of copper, possibly because of the preponderant importance of Cornwall and Devon as sources of copper supply until the middle of the Nineteenth century. Copper is more widely diffused over the earth in rocks of the Permian series of the Devonian system than in any other series of rocks, and the Permian strata are of very extensive occurrence. The Jura-Trias system of the Mesozoic, or age next younger than the Permian, is also prolific in copper. While the Permian beds show more or less copper in most places where outcropping extensively or carefully developed, the percentage of copper contained is apt to be small, though the aggregate of copper so deposited is past computation, owing to the dissemination of the ores through beds that are of vast area.

While native copper is of very frequent occurrence, and is noted in most cupriferous districts, the virgin metal is usually an alteration product, and of little commercial importance. In the Coro Coro district of Bolivia and the Keweenawan district of Lake Superior, native copper is found in such quantities as to permit of its extraction upon an immense scale. The Bolivian copper is found in two adjoining conglomerates, composed mainly of argillaceous sandstones, and of somewhat uncertain geological age. The Lake Superior copper occurs in conglomerate and amygdaloid beds, probably of the Azoic group, though the exact geological horizon is still a matter of dispute. The native metal is most frequently found in eruptive zones, at the various points where it occurs in very considerable quantities, in the sedimentary rocks, such as conglomerates and sandstones, or in the trappean rocks of igneous origin, and more especially in the metamorphosed traps. As an alteration product, native copper may occur in the altered or oxy-carbonate zone of any copper ore body.

The source from which copper came and the manner of its deposition are largely matters for conjecture, though certain features bearing on these questions are fairly well established. The metal and its ores are in all likelihood of igneous origin, coming to the earth's surface or to its crust with the molten magma forced upward from unknown depths. As to the manner of its deposition in veins or beds, there are many theories, of which those most commonly held may be divided into two classes, the first holding that the metal and its ores were deposited in various rock strata and veins from solutions, while the second set of theories is built upon the primary thesis that copper—and other minerals—were deposited by electro-chemical action from sea water, in which process the remains of living organisms are presumed to have played an important part. Both theses have certain corroborative evidences, and both have weak spots. It is possible that ore deposits have come from both sources. It is certain that the sea holds nearly all metals in solution, but, on the whole, the theory of deposition from subterranean solutions seems the most easily tenable.

The more common metals are found as component parts of many ordinary igneous rocks, though in such small quantities that these rocks cannot be considered as ores of even the lowest grade. It is possible, and indeed probable, in the light of the limited amount of exact knowledge now possessed on this point, that subterranean and slightly carbonated surface waters percolating through the various rock strata, very few of which are impervious to water, leached out certain soluble constituents, and that the minerals, so carried in solution, were deposited, usually in crystallized form, in the brecciated rocks and in the numerous cracks in the crust and upper strata of the earth. Carbonic acid, oxygen and sulphur have been the principal reducing agents, carbonic acid gas in water being a powerful solvent. The action and inter-action of these three prime agents, assisted by other reagents set free by them, have caused complex reactions, many of which have been figured out to theoretical perfection, while not a few supposedly natural reactions have the corroborative evidence afforded by synthetical chemical experiments that have given the reactions first established theoretically. In the case of the rich iron ores of the Lake Superior district, their concentration from leaner ores by purely natural means is no longer open to question, except from the ultra-skeptical.

A third theory, once generally held, but now in disfavor, remains to be noted. This is the idea that electrical action caused the deposition of the metals. While the theory now finds few adherents, I must venture the opinion, at the risk of being considered fossilized, that electrical action has played a most important part in the deposition of many metalliferous beds. There are really but two sciences, one being mathematics, which is abstract and perfectable, while the second is the science of the concrete, embracing all matter and its various manifestations. For convenience, the realm of science, an empire vaster than Alexander swayed or Napoleon planned, has been divided into so-called sciences and groups of sciences, but the boundary lines are merely arbitrary abstractions, and have as little physical existence as the equator or the meridians of longitude. Geology shades imperceptibly into mineralogy, which in turn merges into chemistry, dynamics, optics, and electricity. All sciences are interwoven, and electricity, a manifestation of one of the attributes of matter, is an integral part of every other concrete science, from geology to biology, affecting alike the organic and inorganic kingdoms. It is probable that terrestrial magnetism, percolating waters and precipitation from superincumbent seas all played a part in the formation of ore deposits, operating under chemical, thermo-dynamical and electrical conditions of which we now have merely a slight theoretical knowledge. Mother Nature filled the recesses of her myriad subterranean treasure-houses with the wealth that man now wrests from her by brute strength, and the little craft he has been enabled to acquire in the prolonged struggle.

In connection with the foregoing remarks upon the influence of electricity on mineral deposits, it may be remarked that there are puzzling magnetic earth-currents in the Lake Superior native copper districts, these being especially marked upon Isle Royale, where the variation of the magnetic needle is remarkable. It is to be hoped that these phenomena will be given the careful scientific investigation that their importance warrants, at some not distant date. Shortly after the laying of the first Atlantic cable, Ayers Stockley, still a resident of the Lake Superior district, performed some highly interesting experiments in subterranean telegraphy. His apparatus was home-made, but he succeeded in telegraphing for some miles along one of the magnetic currents traversing the cupriferous strata of Ontonagon county, with the crude but effective instruments of his own devising.

It is still a matter of dispute whether many of the great bodies of chalcopyrite and cupriferous pyrite and pyrrhotite are veins or beds. Recent investigation leads to the belief that many of the deposits formerly called beds are in reality entitled to the appellation of veins.

The great predominance of sulphide ores of copper is a notable fact, 75 per cent. of the world's production of the metal coming from ores of this class. It is probably safe to assume that all, or practically all, copper ores were originally sulphides. Chalcopyrite is generally held to be a product of crystallization from fusion. Eventually the upper portions of these chalcopyrite and bornite ore bodies were altered, in the case of the older deposits, mostly to oxide and carbonate ores. In all likelihood this alteration came about from the action of water. The subterranean waters found in all rock strata at greater or less depth, are not oxydizing, but the surface waters have an affinity for carbonic acid, and, carrying this gas in solution, these surface waters, percolating through the rock strata and veins, attack the sulphide ores, which gradually yield up sulphur and become carbonates and oxides, through chemical reactions induced by carbonic acid. For this reason the permanent water level of a mine usually marks the lowest depth at which oxide and carbonate ores are found, and below this point the ores are nearly always sulphides, with a strong tendencey toward lower percentages of copper and higher percentages of iron, as depth is gained.

As chalcopyrite and bornite (compound sulphides of copper and iron) are overwhelmingly the most common ores of copper, and, below the permanent water level, practically the only copper ores, the alteration of these iron-copper sulphides to oxide and carbonate ores (or sometimes to silicates, or the higher sulphides of copper alone) by the action of percolating surface waters, charged with carbonic acid, necessarily sets free one atom of iron for each atom of copper dissociated from the original chemical union, in which one atom each of copper and iron were united with two atoms of sulphur. The iron also forms carbonates or oxides, most usually the latter, and, in the form of limonite, a hydrated sesquioxide of iron, is carried upward in the waters, and stains the rock above or near the surface of the original deposit of chalcopyrite. The characteristic rusty-iron stain of limonite is a prominent feature of the rock-capping surmounting many of the largest copper ore bodies, and this "gossan" or "iron hat" is a welcome sign of copper values below, in nearly every copper-ore mining district of the world. It is not an invariable sign, however, as it is necessarily lacking in many places, such as at imbedded deposits having no outcrop, and unaltered sulphide ore bodies, also at points where the original capping has been removed by surface erosion or glaciation. The gossan may also be found at many points where copper does not lie beneath, but, as a rule, a capping of gossan is a highly favorable sign in a cupriferous district.

The rich oxide and carbonate ores existing at and near the surface in most copper-bearing districts (except in the native copper fields) may safely be considered alteration products from the chalcopyrite and bornite ores found at greater depths. The silicates, phosphates and other ores are probably alteration products also, as are the higher sulphides of copper in which iron is not present, unless as an impurity. In some districts the unaltered sulphides extend to the surface, but this is the exception rather than the rule. The depths to which the carbonate and oxide ores may extend is dependent upon local conditions, and ranges from a few feet to more than one thousand feet. As a rule, the oxide and carbonate and richer sulphide ores (such as chalcocite) give way to unaltered sulphides of copper and iron at the permanent water level. In cases, not so very common, where the altered ores exist below the water level, it is presumed that the alteration occurred during some antecedent age or ages, when the water level was lower, or the rock strata higher. The native copper deposits remain absolutely unaltered in nature or quantity below the water level, which apparently has no effect upon deposits of the virgin metal.

In this place, it may not be amiss to insert a few words of warning and advice to those lacking extended experience in copper mining.. It is undoubtedly true that a geologist of high scientific attainments may make a poor fist at practical mining. Possibly this rule may be considered proven by the brilliant exception recently made by Dr. L. L. Hubbard, who stepped direct from the position of state geologist of Michigan to the general management of a corporation owning undeveloped lands, and within a few months opened what must become one of the greatest copper mines of the world within the next few years. On the other hand, the practical miner to whom is entrusted the development of a new copper mine, may profit greatly by bearing in mind a few facts that are not only geological maxims, but proven by innumerable practical illustrations. It is certain that copper mines—always excepting those producing the native metal—are subject to greater changes with depth than mines of any other class. All mines vary more or less, in width of productive openings and in the values found therein, as depth is gained, but copper ore mines, while varying in width and values with depth just like mines of other metals, are subject to a special series of variations, an understanding of which is of prime importance to owners and managers. In strong veins, where iron-copper sulphides are first encountered, a continuance of the vein to a considerable depth, with comparatively slight alteration, may reasonably be looked for. This does not apply to gash veins, of course, as these are invariably shallow, but the experienced miner is not likely to long mistake a gash vein for a true fissure. In other cases, where the surface openings show rich oxides and carbonates, or chrysocolla and similar ores, it should always be borne in mind that these ores cannot prove permanent. They may extend downward for a few score feet only, or possibly may hold for many hundreds of feet, but sooner or later they will give way at depth to unaltered iron-copper sulphides, as will copper glance or other high-grade ores. The oxides and carbonates, from their richness in metal and the ease with which they may be smelted, are highly desirable ores, and have been the making of many good mines that otherwise would have proven failures, through affording profits with which to open more extensive bodies of lower grade ore at greater depth, and to build and equip the large and costly smelters required for successful treatment of the iron-copper sulphides.

For the reason that a change at depth is inevitable, it is highly important that a new copper mine having high-grade surface ores should prove its property before forming a permanent plan of mining, smelting and financial conduct. This can be done in one way only, and that is by probing the ground. The probing may be done by diamond drills, or by sinking shafts. Diamond drilling is a wonderful aid in exploring new territory, but at best it is only a sort of blind-man's-buff. As a preliminary measure diamond drilling is highly commendable, but for a certainty the shaft or tunnel is the thing. Where a mine is already opened on rich copper ores, sinking is the proper course. This will determine the extent of the richer ore bodies and the nature of the unaltered sulphides. At times highly profitable oxides and carbonates are replaced by sulphides of too low grade to work at a profit. More frequently the richer ores are replaced at depth by sulphides that can be profitably worked, provided a sufficiently extensive mechanical and metallurgical equipment is supplied. As a rule, the better a copper mine at surface, the better at depth, but there are such important exceptions that development is the only safe guide.

For the reasons set forth in the foregoing paragraphs, it is important that the management of a copper ore mine have more than a surface knowledge of its property before laying out permanent plans. Handsome profits may be earned from surface and sub-surface ores, but if these be paid out in dividends as quickly as earned, the change in the ore, certain to come at some depth, may leave the company with a depleted treasury to face the problem of raising large sums for development and equipment. Shareholders will pay assessments more readily on a new or developing mine than on one that has been a dividend payer. In connection with the advice contained in the preceding paragraphs, there are sections in the chapter on metallurgy of interest to those lacking experience who may be responsible for the development of new mines. To the experienced mining men I am not offering advice. Such men are always seeking for information to add to their already extensive stocks, but they do not hanker for advice.

The various chapters on the ore deposits of the world will be found to contain a great amount of geological matter of a more specific nature than given in the preceding pages, and geological data of a still more detailed nature will be found in many of the descriptions of mines. In the chapter on chemistry and mineralogy there are detailed descriptions of the physical and chemical characteristics of the metal and its various ores and minerals, of which the principal, from an economical standpoint, are native copper, chalcopyrite, bornite, chalcocite, malachite, azurite, tenorite, cuprite and chrysocolla.

CHAPTER III.

CHEMISTRY AND MINERALOGY OF COPPER.

In the following pages will be found a list of the ores and alloys of copper, with brief descriptions, the detail depending somewhat upon the importance or special interest possessed. The native metal itself is included in the list, which also gives the synonyms of the principal copper ores.

No attempt has been made to render this chapter exhaustive, despite its considerable length. Readers desiring further and more detailed knowledge of the various ores, including their optical properties, complete pyrognostics and crystallization, are referred to the standard works on mineralogy. It is believed, however, that the pages appended may prove of some assistance to the general reader interested in the subject of copper, and possibly will interest the scientist as well, because of being the first encyclopædic list of exclusively copper minerals ever published.

Following is a list of the elements with which copper is found chemically united in nature. This list includes 29 of the 77 elements known to science at this writing. Following the name of each element is its chemical symbol and atomic weight, as now figured by the best authorities.

Element	Symbol	Atomic weight	Element	Symbol	Atomic weight
Aluminum	Al	27.1	Nitrogen	N	14.04
Antimony	Sb	120.	Oxygen	O	16.
Arsenic	As	75.	Phosphorus	P	31.
Bismuth	Bi	208.3	Platinum	Pt	195.
Calcium	Ca	40.1	Selenium	Se	79.2
Carbon	C	12.	Silicon	Si	28.4
Chlorine	Cl	35.45	Silver	Ag	107.93
Cobalt	Co	59.	Sulphur	S	32.06
Copper	Cu	63.6	Tellurium	Te	127.5
Hydrogen	H	1.01	Tin	Sn	119.
Iron	Fe	56.	Tungsten	W	184.
Lead	Pl	206.9	Uranium	U	240.
Manganese	Mn	55.	Vanadium	V	51.4
Nickel	Ni	58.7	Zinc	Zn	65.4
Niobium	Nb	93.7			

The elements with which copper unites most frequently are as follows, in approximate order of frequency and preference: Sulphur, oxygen, carbon, arsenic, antimony, bismuth, silica, chlorine, phosphorus, nitrogen, selenium, wolframium (tungsten), uranium, and vanadium.

The ores of copper (alone or with other metals) may be divided into the following groups·

Antimonides
Arsenates
Arsenides
Arsenites
Carbonates
Chlorides
Molybdates
Niobates
Nitrates
Oxides
Oxychlorides
Phosphates
Selenides
Selenites
Silicates
Sulphoantimonates
Sulphoantimonites
Sulphoarsenates
Sulphoarsenites
Sulphides
Sulphates
Sulphobismuthites
Tellurides
Tungstates
Uranates
Vanadates

An alphabetical list of copper minerals, and alloys, including native copper and synonyms, is appended.

ADAMITE. Essentially a hydrous arsenate of zinc, but copper may replace the zinc to extent of from a trace to 23.5% cupric oxide.

AIKINITE. $PbCuBiS_3$. Common names: Needle ore, acicular bismuth. Copper 11%, bismuth 36.2%, lead 36%, sulphur 16.8%. Orthorhombic. Crystals embedded; acicular, striated; also massive. Fracture: Uneven. Hardness: 2 to 2.5. Gravity: 6.1 to 6.8. Luster: Metallic. Color: Blackish lead gray, tarnishing to pale copper red. Opaque. Fuses on charcoal. Soluble in nitric acid. Occurrence: Ural Mountains of Russia, and Gold Hill, North Carolina, U. S. A.

ALASKAITE. An argentiferous galena-bismuthite in which lead is partially replaced by silver, 3.25% to 8.75%, and copper 3.5% to 5.1%, with traces of zinc, antimony and iron.

ALGODONITE. Cu_6As. Copper 83.5%, arsenic 16.5%. Occurrence: Chile and Lake Superior.

ALISONITE. A sulphide of lead and copper. Probably $3Cu_2S, PbS$.

ALUMINUM BRONZE. An alloy of copper and aluminum.

AMMIOLITE. Antimonite of copper and mercury. Cupric oxide 15.5% to 18%.

ANDREWSITE. A phospho-silicate of copper, iron, manganese and aluminum. About 11% cupric oxide.

ANNIVITE. A bismuthiferous stibio-arsenate of copper, carrying about 4% iron and 2% zinc. A complex mineral of the tetrahedrite-tennantite family.

ANTIMONIAL COPPER. Chalcostibite.

ANTLERITE. A basic sulphate of copper with traces of zinc and calcium; chemical formula uncertain, contains cupric oxide 67% to 68%.

APHTONITE. A tetrahedrite carrying silver, iron and zinc.

ARNIMITE. $5CuO, 2SO_3+6H_2O$. Copper 45.5% to 48%.

ASPEROLITE. Probably $CuSiO_3, 3H_2O$. Same as chrysocolla, except in excess of water.

ATACAMITE. $Cu_2ClH_3O_3$. Copper 15.9%, cupric oxide 55.8%, chlorine 16.6%, water 12.7%. Cleavage: Imperfect to perfect. Fracture: Conchoidal. Brittle. Hardness: 3 to 3.5. Gravity: 3.75 to 3.77. Luster: Adamantine to vitreous. Color: Emerald to blackish green. Streak: Apple-green. Transparent to translucent. Occurs as sandy granules in the province of Atacama, Chile, where first discovered, also at many other points. A valuable ore of copper where found in commercial quantity.

ATELITE. A hydrated cupreous bi-chloride, $2CuO,CuCl_2+3H_2O$. From crater of Vesuvius, apparently at pseudomorphs after tenorite, and nearly the same as atacamite chemically.

ATLASITE. A copper chloro-carbonate apparently between atacamite and malachite. From Chanarcillo, Chile.

AURICHALCITE. $2(ZnCu)CO_3, 3(ZnCu)(OH)_2$. A basic carbonate of copper and zinc. Carries about 21% cupric oxide. Monoclinic in acicular crystals, forming drusy incrustations; also columnar, laminated and granular. Hardness: 2. Gravity: 3.5 to 3.6. Luster: Pearly. Color: Pale green to sky blue. Streak: Light green to light blue. Translucent. Soluble in acids. Occurs in small quantities at numerous points.

AZURITE. $3CuO,2CO_2,H_2O$. Common names: Blue carbonate of copper, azure copper ore. Monoclinic; also massive to earthy. Cleavage: Perfect, but interrupted. Fracture: Conchoidal. Brittle. Hardness: 3.5 to 4. Gravity: 3.77 to 8.83. Luster: Vitreous. Color: Azure blue. Streak: Lighter blue. Transparent to subtranslucent. Soluble in nitric acid. A fairly common ore of copper.

BARNHARDTITE. Apparently a chalcopyrite partly altered to chalcocite, by loss of part of iron content. Assays 47% to 50% copper and 20% to 22.5% iron.

BAYLDONITE. A hydrous arsenate of copper and lead, carrying about 26% copper.

BELL-METAL ORE. Stannite.

BERZELIANITE. A selenide of copper, Cu_2Se. Copper 61.6%. Part of copper replaced with silver at times.

BEUDANTITE. A complex and somewhat uncertain arseno-phosphate or phospho-arsenate of iron, copper and lead, with sulphates of the metals present in varying quantities. Contains 8.5% to 12.3% cupric oxide.

BINNITE. $3Cu_2S, 2As_2S_3$. Copper 39.2%. Carries also a little lead, iron and silver.

BJELKITE. A cupriferous cosalite.

BLANCHED COPPER. An alloy of copper and arsenic.

BLUESTONE. Sulphate of copper. Blue vitriol. Chalcanthite.

BOGOSLOVSKITE. Apparently an impure chrysocolla, carrying carbon dioxide.

BOLEITE. Apparently a variety of percylite carrying chloride of silver. Has 14% to 15% copper, 48% to 51% lead and about 9% to 10% silver. From Boleo mine, Mexico.

BORNITE. Cu_3FeS_3. Copper 55.5%, Iron 16.4%, sulphur 28.1%. Common name: Peacock copper ore. Isometric; many hexagonal penetration twins. Habit, cubic. Massive. Structure: granular or compact. Fracture: Small conchoidal, uneven. Brittle. Hardness: 3. Gravity: 4.9 to 5.4. Luster: Metallic. Color: Copper red to bluish brown, quickly tarnishing to iridescence. Streak: Pale grayish black. Opaque. Soluble in nitric acid with separation of sulphur. Occurrence: In most of the important copper fields of the world. Uses: The second most important ore of copper.

BOURNONITE. $PbCuSbS_3$. Copper 13%, lead 42.5%, antimony 24.7%, sulphur 19.8%. Massive; granular and compact. Crystals, orthorombic. Cleavage: Imperfect. Fracture: Subconchoidal to uneven. Rather brittle. Hardness: 2.5 to 3. Gravity: 5.7 to 5.9. Brilliant metallic luster. Color and Streak: Steel gray, inclining to blackish lead-gray or iron black. Opaque. Fuses easily on charcoal. Decomposed by nitric acid. Occurrence: Hartz Mountains and Saxony, Bohemia, Hungary, Carinthia, Cornwall, Chile, Bolivia, Peru, Canada, Arkansas, Colorado, etc.

BRASS. An alloy of copper and zinc, about 2 parts copper to 1 of zinc.

BROCHANTITE. A basic sulphate of copper. $4CuO,SO_3,3H_2O$, carrying 70.3% cupric oxide.

BRONZE An alloy of copper and tin. The varying proportions give differing colors and qualities, such as bell-metal, medal bronze, gun-metal, etc.

CACHEUTAITE. A selenide of lead, copper and silver, with occasional traces of cobalt and iron, carrying 7% to 36% copper.

CALCIOVOLBORTHITE. A hydrous vanadate of copper, calcium, magnesium and manganese. Copper 30% to 35%.

CALIDONITE. A basic sulphate of lead and copper. Chemical composition uncertain. Cupric oxide about 10%.

CANTONITE. A dimorphic variety of covellite crystallized in cubes, with cubical cleavage.

CAPILLARY RED OXIDE OF COPPER. Cuprite.

CARROLLITE. CuS,Co_2S_3. Copper 20.5%, cobalt 38%, sulphur 41.5%. Occurrence: Carroll county, Maryland.

CASTILLITE. A bornite of uncertain formula, carrying approximately, copper 41%, zinc 12%, lead 10%, silver 4%, iron 7%.

CHALCANTHITE. $CuSO_4+5H_2O$. Common names: Blue vitriol, bluestone, sulphate of copper. Carries about 25% copper. Triclinic. As crystals, also massive, stalactitic and reniform, sometimes with fibrous structure. Luster: Vitreous. Color: Sky blue. Subtransparent to translucent. Soluble in water. Solution will deposit metallic copper on iron.

CHALCOCITE. Copper glance. Cu_2S. The richest sulphide ore, carrying copper 79.8%, sulphur 20.2%, also frequently iron or silver in small quantities. Orthorhombic: Also massive, with structure granular to compact and impalpable. Cleavage: Indistinct. Fracture: Conchoidal. Somewhat brittle. Hardness: 2.5 to 3. Gravity: 5.5 to 5.8. Luster: Metallic. Color and Streak: Blackish lead-gray, tarnishing to dull green or blue. Opaque. Soluble in nitric acid. Occurrence: In nearly all sulphide copper districts of the world in small quantities, occasionally in considerable bodies. Uses: The richest commercial ore of copper.

CHALCOPYRITE. $CuFeS_2$ (or Cu_2S,Fe_2S_3). Copper 34.5%, iron 30.5%, sulphur 35%. Frequently mixed with pyrrhotite; occasionally carries gold or silver. Tetragonal; sphenoidal, often twinning; also frequently massive and compact. Fracture: Uneven. Hardness: 3.5 to 4. Gravity: 4.1 to 4.3. Luster: Metallic. Color: Brass yellow, often tarnishing to iridescence. Streak: Greenish black. Opaque. Soluble, except sulphur, in nitric acid. On being heated yields up a portion of its sulphur. On exposure to moisture and heat becomes hydrated, and copper and iron change readily to sulphates. Occurrence: In every copper field of importance. The most common ore of copper, and the source of nearly 75% of the world's supply of the metal.

CHALCOMENITE. A hydrous selenite of copper. $CuSeO_3+2H_2O$. Carries about 35% cupric oxide and 48% selenium dioxide.

CHALCOPHYLLITE. A highly basic arsenate of copper; formula given variously—simplest is $7CuO,As_2O_5,14H_2O$. Percentage of cupric oxide 44.5% to 53%.

CHALCOPYRRHOTITE. Fe_4CuS_6. Copper 13%, iron 48%, sulphur 38%. Occurrence: Cuba and Sweden.

CHALCOSIDERITE. $CuO, 3Fe_2O_3, 2P_2O_5, 8H_2O$. Cupric oxide about 8%.

CHALCOSINE. Chalcocite.

CHALCOSTIBITE. Cu_2S, Sb_2S_3. Essentially a sulpho-antimonide of copper, carrying about 25% copper, 48% antimony, 26% sulphur, with 1% to 2% iron and occasionally a fractional percentage of lead.

CHALCOTRICHITE. A form of cuprite with capillary or acicular crystallization.

CHENEVIXITE. A hydrous arsenate of copper and iron, formula uncertain. Cupric oxide about 26.3%.

CHESSY COPPER. Azurite.

CHILENITE. Probably Ag_6Bi, with copper replacing silver to extent of about 7%.

CHIVIATITE. A sulphide of lead and bismuth in which lead is partly replaced by copper to extent of about 2.5%. Occurrence: Chiviato, Peru.

CHLOANTHITE. Empirically $NiAs_2$, a diarsenide of nickel. In analyses invariably shows cobalt and iron, and frequently traces of copper bismuth, antimony, lead and silver. The ease with which partial replacement of the nickel is effected in both chloanthite and smaltite calls attention to the minerals keweenawite and mohawkite, which, though lower in the series of arsenides, are very properly described by Dr. Koenig, the discoverer, as compound arsenides, the formula being written (CuNiCo). The same formula might be used to advantage with chloanthite, smaltite and sundry other arsenides of protean forms.

CHLOROTILE. Cu_3, $As_2O_8+6H_2O$. Carries about 32.5% copper. A hydrous arsenate of copper. Orthorhombic; fibrous and massive. Soft. Color: Pale emerald green. Transparent.

CHRYSOCOLLA. $CuSiO_3$, $2H_2O$. Carries about 36.1% copper. Common name: Mountain green and Mountain blue. Cryptocrystalline, enamel-like. Sometimes botryoidal. Fracture: Conchoidal. Brittle and somewhat sectile. Hardness: 2 to 4. Gravity: 2 to 2.24. Luster: Vitreous to earthy. Color: Mountain green, bluish green, sky blue to turquoise blue. Impure varieties, brown to dull black. Streak: White from pure varieties. Translucent to opaque. Decomposed by acids without gelatinization. Occurrence: Frequently with other ores, especially in upper portions of veins.

CLARITE. Probably a dimorphus form of enargite.

CLAYITE. A stibio-arsenate of lead, with lead replaced to extent of about 8% copper and a trace of silver.

CLINOCLASITE. $6CuO$, $As_2O_5+3H_2O$. Carries 48% to 50% copper. A hydrous arsenate of copper. Cleavage: Highly perfect. Brittle. Hardness: 2.5 to 3. Gravity: 4.19 to 4.36. Luster: Vitreous to resinous. Color and Streak: Bluish-green. Subtransparent to translucent. Soluble in nitric acid. Occurrence: Cornwall and Utah.

CONDURRITE. A soft, black copper ore, found in Cornwall; supposed to be an alteration product of tennantite.

CONICHALCITE. An arsenate of copper and calcium, carrying occasionally zinc and vanadium. Cupric oxide about 28% to 32%.

CONNELLITE. A hydrous sulpho-chlorate of copper, carrying 72.3% cupric oxide.

COPPER. Cu. Native copper. The chemical symbol Cu is an abbreviation of cuprum, the Latin word for copper. The metal, native or refined, has the following names in the modern languages: kupfer in German; kopper in Swedish; kobber in Norwegian; cobre in Spanish and Portuguese; cuivre in French; rame in Italian.

Atomic weight, 63.6. Belongs in the first group and is the leader of the fifth series of Mendeleef's Periodic System. The group is as follows: 1. hydrogen; 2. lithium; 3. sodium; 4. potassium; 5. copper; 6. rubidium; 7. silver; 8. caesium; 9. unknown (possibly terbium, atomic weight 160); 10. gold; 11. unknown. The fifth series, of which copper is the basic leader, is as follows: 1, copper; 2, zinc; 3, gallium; 4, germanium; 5, arsenic; 6, selenium; 7, bromine. The three metallic elements falling between series four and five in Mendeleef's table, are iron, cobalt and nickel. The frequency with which these three elements are found associated with copper, and the ease with which all four metals replace one another are notable. The general resemblance between copper, silver and gold, which form ascending steps in the same group, is readily apparent. Mendeleef's Periodic System may not prove the key to unlock the chemical secrets of nature, but it may be compared to a single tumbler in a combination lock, which has been nearly set in its proper position for opening.

System of crystallization, isometric. Tetrahexahedronal forms the most common, with much twinning. Crystals often show cavernous faces and occasionally elevations. Crystals are often distorted and pass gradually through distortions into filiform and arborescent forms. Druses, often of considerable size, in Lake Superior native copper mines, notably the Central and Phœnix mines in Keweenaw county, afford many curious crystallizations, filiform and arborescent. Native copper also occurs massive, and in granular form, and in laminæ. In the Lake Superior mines the metal occurs in all observed forms and sizes; in lamellar form, from microscopic flakes up to sheets of immense size and weight; in crystals of greatly varying form and size; in grains from microscopic size to considerable nodules, and in the various filiform and arborescent shapes in druses. The finest particles are grains and exceedingly minute flakes occurring in an upper sandstone of the Keweenawan series, while the largest masses, weighing upwards of 500 tons, have been found in contact and fissure veins in Keweenaw and Ontonagon counties, though the bulk of the copper produced is secured from the stratified igneous and sedimentary beds of the Keweenawan series.

Cleavage: None. Fracture: Hackly. Tenacity: Second only to that of iron. Perfectly sectile. Highly ductile and malleable, ranking in these particulars with the precious metals. Electrical conductivity, 931, as compared with 1,000 for silver, which possesses the most perfect electrical conductivity of any known metal or alloy. Conductivity for heat, 898, as compared with 1,000 for gold, the most perfect conductor of heat.

Hardness: 2.5 to 3. Specific gravity, in vacuo, at 0 degrees Centigrade (equal to 32°, or freezing point Fahrenheit), when chemically pure and devoid of porosity, is 8.945. Specific gravity of ordinary copper of commerce, none of which is free from impurities, varies from about 8.75 when cast to about 8.95 when rolled, hammered or drawn, the exact gravity depending upon how handled and extent and nature of impurities present.

Luster: Metallic. Color: Copper-red. Streak: Copper-red, metallic, shining. Tarnishes upon exposure of air to brownish red, and is liable to form a coating of verdigris or oxide upon long exposure to air. Atmosphere laden with moisture and carbonic acid is especially favorable for the formation of verdigris.

Fusibility: Copper is fusible at approximately 2,000° Fahrenheit, or a trifle less than 1,100° Centigrade. Color, when fused, sea-green. Copper becomes volatile under the high temperature of the electric arc.

Solubility: Copper is soluble in nitric acid, aqua regia, and strong boiling sulphuric acid, also, slowly, in dilute hydrochloric and sulphuric acids, with admission of air. When in solution in nitric acid will deposit metallic copper on iron immersed therein.

Affinities: Copper has a greater affinity for sulphur than for any other element. Also possesses marked affinities for arsenic, antimony, bismuth. oxygen and carbon dioxide, and unites with many other elements.

Alterations: Native copper alters on exposure, especially in damp air, to the simpler oxide and carbonate ores, such as cuprite, malachite and azurite, and occasionally, in time, to the more complex ore forms.

Occurrence: Native copper occurs, usually in small quantities, in most of the principal copper-ore producing districts of the world. The native metal is mined upon a considerable scale only in Bolivia and Lake Superior, U. S. A. The Lake Superior district is notable for producing copper from deposits of the native metal almost exclusively. The Lake Superior native copper carries considerable silver, but no gold. In districts outside of Lake Superior and Bolivia the metal occurs most frequently in connection with the oxide and carbonate ores, and occasionally with the more common sulphide ores.

Impurities: The native copper frequently contains silver, arsenic, bismuth, antimony, zinc, iron and mercury. Commercial copper, refined from ores, may contain any of the elements already named, and also gold, lead, selenium and tellurium, the latter two elements in very minute quantities.

COPPER GLANCE. Chalcocite.

COPPER NICKEL. Niccolite.

COPPER PITCHBLENDE. A ferruginous chrysocolla.

COPPITE. A tetrahedrite carrying about 13% of iron.

CORNWALLITE. $5CuO, As_2O_5, 3H_2O$. Cupric oxide 58.2%.

COSALITE. A sulphide of lead and bismuth in which lead is frequently displaced by copper to the extent of 1% to 9% and silver 1% to 16%.

COVELLINE. Covellite.

COVELLITE. Cupric sulphide. CuS. Copper 66.4%. An alteration product from chalcocite and other sulphide copper ores.

CREDNERITE. $Cu_3Mn_4O_9$. Cupric oxide 43%, manganese sesquioxide 57%. Monoclinic; foliated crystalline. Cleavage: Basal, very perfect; less distinct in other directions. Hardness: 4.5. Gravity: 4.9 to 5.1. Luster: Metallic. Color: Iron black to steel gray. Streak: Brownish-black. Soluble in hydrochloric acid.

CROOKESITE. A selenide of copper, silver and thallium, $(Cu, Tl, Ag)_2Se$, carrying 44% to 46.5% copper, 1.5% to 5% silver and 16% to 18.5% thallium.

CUBANITE. $CuFe_2S_4$. Copper 23.3%, iron 41.3%, sulphur 35.3%. Also carries silica, and sometimes small percentages of lead and zinc.

CUPRIC OXIDE. CuO. Monoxide of copper. One atom of copper and one of oxygen, chemically united.

CUPRITE. Cu_2O. Copper 88.8%, oxygen 11.2%. Common names: Octahedral copper ore; red glassy copper ore; ruby copper. Isometric; commonly in octahedrons; also massive, granular; sometimes earthy. Cleavage: Interrupted. Fracture: Conchoidal. Brittle. Hardness: 3.5 to 4. Gravity: 5.85 to 6:15. Luster: Adamantine to earthy. Color: Light to dark red. Streak: Shining brownish red. Subtransparent to subtranslucent. Soluble in concentrated hydrochloric acid. Found in most copper districts, especially near surface.

CUPROBISMUTITE. Essentially $3Cu_2S$, $4Bi_2S_3$, in which silver sometimes partly replaces the copper. Carries 7% to 16% copper, with slight amounts of silver and iron, and occasionally lead.

CUPRODESCLOIZITE. A complex hydrous arseno-phospho-vanadate of lead, zinc, copper, iron and manganese. Cupric oxide from 6.75% to 11.21%.

CUPROPLUMBITE. A sulphide of lead and copper; probably Cu_2S,PbS. Carries about 20% copper. From Chile.

CUPROSCHEELITE. A tungstate of copper and calcium, carrying silica. Has 3% to 7% cupric oxide.

CUPROTUNGSTITE. Tungstate of copper. $CuWO_4$. Carries about 30% cupric oxide.

CUPROUS OXIDE. Cu_2O. Two atoms of copper chemically united with one atom of oxygen.

CYANOCHALCITE. A phosphoriferous chrysocolla.

CYANOCHROITE. $CuSo_4$, $K_2So_4+6H_2O$. Hydrous sulphate of copper and potash. Carries about 18% cupric oxide.

CYANOTRICHITE. Formula perhaps $4CuO,Al_2O_3,So_3+H_2O$. A hydrous basic sulphate of copper and aluminum. Cupric oxide 47% to 50%.

DARWINITE. Whitneyite.

DELAFOSSITE. An oxide of iron, copper and aluminum, carrying about 47.5% monoxide of copper.

DEMIDOVITE. A phosphoriferous chrysocolla.

DIHYDRITE. $5CuO$, $P_2O_5+2H_2O$. Carries about 55% copper. Monoclinic; massive; fibrous. Cleavage: Imperfect. Fracture: Conchoidal to uneven. Brittle. Hardness: 4.5 to 5. Gravity: 4 to 4.4. Luster: Adamantine. Color: Dark emerald green. Streak: Pale emerald green. Translucent. Soluble in nitric acid. Occurrence: Germany and the Urals.

DIOPTASE. H_2CuSiO_3 or (CuO, SiO_2, H_2O). Cupric oxide 50.4%, silica 38.2%, water 11.4%. Common names: Emerald copper; emerald malachite. Rhombohedral; tetartohedral; also massive. Cleavage: Perfect. Fracture: Conchoidal to uneven. Brittle. Hardness: 5. Gravity: 3.28 to 3.35. Luster: Vitreous. Color: Emerald green. Streak: Green. Transparent to subtranslucent. Fusible with charcoal and soda. Gelatinizes with hydrochloric acid. Occurrence: Siberia, Hungary, Arizona, etc.

DOGNACSKAITE. A sulphide of bismuth and copper, carrying about 12% copper. From Hungary.

DOLEROPHANITE. A basic sulphate of copper, probably $2CuO, SO_3$, with 62.27% to 65.2% cupric oxide. A sublimation product from the laboratory of Vesuvius.

DOMEYKITE. Cu_3As. Common name: Arsenical copper. Carries 71.7% copper, 28.3% arsenic. Reniform and botryoidal; also massive. Fracture: Uneven. Hardness: 3 to 3.5. Gravity: 7.2 to 7.75. Luster: Metallic. Color: Tin white to steel gray, with iridescent tarnish. Occurrence: Lake Superior, Chile, Mexico and Saxony.

EHLITE. $5CuO, P_2O_5+3H_2O$. Carries about 53% copper. Closely related chemically and in physical characteristics to pseudomalachite and dihydrite.

EMERALD COPPER. Dioptase.

EMPLECTITE. Cu_2S, Bi_2S_3. Carries bismuth 62%, copper 19%, sulphur 19%, with occasional silver, iron, lead, and silica, also traces of tellurium.

ENARGITE. Cu_3As_4. Copper 48.3%, arsenic 19.1%, sulphur 32.6%. Orthorhombic. Small crystals, also massive; granular and columnar. Cleavage: Perfect to indistinct. Fracture: Uneven. Brittle. Hardness: 3. Gravity: 4.45. Luster: Metallic. Color and Streak: Grayish black to iron black. Opaque. Fuses on charcoal. Soluble in aqua regia. Occurrence: South America, Mexico, Luzon in the Phillipine Islands, also several American states.

EPIGENITE. Chemical formula uncertain. A sulpho-arsenide of copper and iron. Constituents by weight, about: Copper 41%, iron 15%, arsenic 12%, sulphur 32%. Orthorhombic. In short prisms, resembling arsenopyrite. Fracture: Uneven. Hardness: 3.5. Luster: Metallic. Color: Steel gray. Streak: Black. Soluble in nitric acid. Occurrence: Wittichen in Baden, Germany.

ERINITE. $5CuO, As_2O_5. 2H_2O$. Carries about 47.8% copper. Mamillated concentric crystalline groups; fibrous and rough. Brittle. Hardness: 4.5 to 5. Gravity: 4.04. Luster: Slightly resinous. Color: Emerald green. Streak: Grass green. Subtranslucent to opaque. Soluble in nitric acid. Occurrence: Cornwall and Utah.

ERUBESCITE. Bornite.

ERYTHROCALCITE. $CuCl_2+2H_2O$. Deliquesces on exposure. From crater of Vesuvius.

EUCAIRITE. A selenide of copper and silver. Cu_2Se, Ag_2Se. Copper 25.3%, silver 43.1%, selenium 31.6%.

EUCHROITE. A complex hydrous arsenate of copper, carrying 47.1% cupric oxide.

FAHLERZ. Tetrahedrite. Gray copper ore.

FAHLORE. Tetrahedrite.

FAMATINITE. Cu_3SbS_4, arsenic occasionally replacing the antimony. Copper 43.3%, antimony 27.4%, sulphur 29.3%. Orthorhombic; Isomorphous with enargite; also massive. Fracture: Uneven. Brittle. Hardness: 3.5. Gravity: 4.57. Gray with copper-red tinge. Streak: Black. Opaque. Fusible on charcoal. Decrepitates in closed tube. Occurrence: Cerro de Pasco, Peru.

FIELDITE. A stibio-arsenate of copper, having about 37% copper, 7% zinc, 1.2% iron and traces of gold and silver.

FOOTEITE. Formula probably $8Cu(OH)_2, CuCl_2+4H_2O$. A hydrous chloride of copper.

FOURNETITE. Probably a mechanical admixture of galena and tetrahedrite.

FREDERICITE. A tennantite carrying about 6% iron, 3.4% tin, 2.9% silver and 3.4% lead.

FREIBERGITE. A tetrahedrite carrying 26% to 31% silver, as well as small quantities of iron and zinc.

FRIGIDITE. A tetrahedrite carrying about 8% nickel and 13% iron.

GERHARDTITE. A basic cupric nitrate. $4CuO, N_2O_5, 3H_2O$. Contains 66.2% cupric oxide, 22.5% nitrogen pentoxide, and 11.3% water.

GERMAN SILVER. An alloy of about 5 parts copper, 2 parts zinc and one part nickel.

GLASBACHITE. Zorgite.

GRUENAUITE. A supposedly impure polydimite (nickel sulphide) carrying 11.5% copper, also bismuth, iron, cobalt and lead.

GUEJARITE. $Cu_2S, 2Sb_2S_3$. Carries about 15.5% copper, 58.5% antimony and 25% sulphur. From Andalusia, Spain, found with siderite.

HENWOODITE. A phospho-arsenate of copper, with occasional aluminum and iron. About 7% cupric oxide.

HERMESITE. A tetrahedrite carrying mercury.

HERRENGRUNDITE. $CaO, 4CuO, 2SO_3+6H_2O$. Carries 50% to 54% cupric oxide.

HOMICHLINITE. Apparently a chalcopyrite partly altered to bornite. Carries about 44% copper and 26% iron.

HORSFORDITE. An antimonide of copper, probably Cu_6Sb. Carries about 73% copper, 27% antimony. Massive. Fracture: Uneven. Brittle. Hardness: 4 to 5. Gravity: 8.8. Luster: Metallic. Color: Silver white, tarnishing easily. Opaque. Occurrence: In large deposits near Mitylene, Asia Minor.

HYDROCIANITE. Cupric sulphate. $CuSO_4$. A rare sulphate from Vesuvius. Effloresces in the air.

INDIGO COPPER. Covellite.

JALPAITE. Probably $3Ag_2S$, Cu_2S, giving about 13% copper.

JOHANNITE. A hydrous sulphate of uranium and copper, of uncertain formula, carrying about 6% cupric oxide, and 67% to 68% uranic trioxide.

JULIANITE. A tetrahedrite-tennantite carrying less than 1% each of silver and iron, with about 52% of copper.

KEWEENAWITE. $(CuNiCo)_2As$. Carries 39% to 54% copper, 9.7% to 20% nickel, 0.9% cobalt. An arsenide of copper, nickel and cobalt, of the mohawkite family. No crystals are known. Cleavage: Subconchoidal. Fracture: Uneven. Tenacity: Slight. Hardness: 4. Gravity: 7.7. Luster: Metallic. Opaque. Color: Pale red, tarnishing to darker red. Soluble in nitric acid. Occurrence: In the Mohawk mine, Keweenaw county, Michigan. Uses: Is smelted, in conjunction with mohawkite.

KLAPROTHOLITE. $3Cu_2S$, $2Bi_2S_3$. Carries 24% to 29% copper and 51.5% to 54% bismuth with 1% to 1.7% iron.

KROEHNKITE. $CuSo_4$, $NaSo_4+,2H_2O$. A hydrous sulphate of copper and sodium. Carries about 47% cupric oxide.

LANGITE. A basic sulphate of copper. $4CuO$, SO_3, $4H_2O$. Carries about 17% cupric oxide.

LAMPADITE. Cupreous manganese containing 4% to 18% cupric oxide.

LAVENDULAN. A hydrous arsenate of copper, cobalt and nickel. Constituents by weight: About 32% copper, 2.5% CoO, 1.35% NiO. Amorphous. Fracture: Conchoidal. Hardness: 2.5 to 3. Gravity: 3.01. Luster: Greasy to vitreous. Color: Lavender blue. Streak: Pale lavender blue. Translucent. Soluble in warm hydrochloric acid. Occurrence: Saxony and Chile.

LAXMANNITE. Phosphochromite.

LEPIDOPHARITE. A cupreous manganese oxide of fibrous and scaly form, from Thuringia.

LETTSOMITE. Cyanotrichite.

LEUCOCHALCITE. A hydrous arsenate of copper. In slender needle crystals. Color: Greenish white. Cupric oxide 47.2%.

LIBETHENITE. $4CuO$, P_2O_5, H_2O. Carries about 53% copper. Common name: Phosphate of copper. Orthorhombic. Fracture: Subconchoidal to uneven. Brittle. Hardness: 4. Gravity: 3.6 to 3.8. Luster: Resinous. Color and Streak: Olive green. Subtranslucent. Soluble in nitric acid. Occurrence: Hungary, Germany, Russia, Bolivia, Chile, Cornwall.

LIME-MALACHITE. A hydrous carbonate of copper with carbonate and sulphate of calcium.

LINARITE. A basic sulphate of copper and lead, PbO, CuO, SO_3, H_2O. contains about 17% to 20% cupric oxide.

LINDACKERITE. A complex hydrous sulpho-arsenate of copper, nickel and iron; cupric oxide 36.34%, nickel monoxide 16.15%.

LINNAEITE. A sulphide of cobalt in which cobalt is sometimes partially replaced by nickel, copper and iron, to extent of 1% to 42% nickel, 2% to 6% iron and 1% to 8% copper.

LIRCONITE. Octahedral arsenate of copper. Probably 18CuO, $4Al_2O_3$ $5As_2O_5+55H_2O$. Carries about 28.5% copper. Monoclinic; rarely granular. Cleavage: Subconchoidal. Imperfectly sectile. Hardness: 2 to 2.5. Gravity: 2.88 to 2.98. Luster: Vitreous. Color and Streak: Sky blue to verdigris green. Soluble in nitric acid. Occurrence: Cornwall and Hungary.

LUZONITE. Apparently a dimorphous form of enargite, found in the island of Luzon, P. I.

LYELLITE. An impure variety of langite, containing gypsum and iron.

MALACHITE. 2CuO, CO_2+2H_2O. Green carbonate of copper, the most common carbonate. Monoclinic; acicular or prisms. Commonly massive or frequently incrustive. Sometimes granular or earthy. Fracture: Subconchoidal, uneven. Brittle. Hardness: 3.5 to 4. Gravity: 3.9 to 4.03. Luster of crystals, adamantine to vitreous. Color: Bright green. Streak: Green. Opaque to translucent. Soluble in nitric acid. Occurrence: In most copper districts. Uses: An important ore of copper in certain districts.

MALINOWSKITE. A tetrahedrite carrying 13% to 16% lead, also silver and zinc in small percentages.

MARCYLITE. An alteration product of copper sulphide, consisting of hydrated oxides and sulphides of copper. Found in Arkansas, U. S. A., and Peru.

MATTRAMITE. A vanadate of lead and copper sometimes carrying also iron, zinc, manganese, magnesium and calcium oxides. From 19% to 21% cupric oxide.

MELACONITE. Tenorite.

MELANOCHALCITE: Form: Amorphous or cryptocrystalline. Color: Jet black, coffee brown powder. Luster: Vitreous. Hardness: 4. Specific gravity: 4.14. Opacity: The fine particles are translucent under high power of microscope, light passing through as yellow-brown. Chemical characters: Heated in a closed tube loses water and carbon dioxide and powder turns from coffee brown to brown black. With borax gives the sky blue color of copper. With salt of phosphorus gives a skeleton of silica in the blue glass. Is decomposed by hydrochloric acid, even a 3% solution of acid changing a fragment into a white silicious mass retaining the outlines of the original fragment, and only cupric chloride being produced. Composition: CuO, 76.88; SiO_2, 7.80; CO_2, 7.17; H_2O, 7.71; MO, .41; FeO_3, .07.

SiO_2 and CO_2 replace each other within certain limits. From this fact and the behavior of the mineral under dilute hydrochloric acid, it is deduced by Dr. Geo. A. Koenig, who identified the mineral, late in 1902, that there exists in it a compound orthoacid, $H_4(Si,C)O_4$, with the hydrogen replaced by copper. Viewed in this light melanochalcite represents the basic copper salt of the ortho-silico-carbonic acid, the figures of the analysis agreeing closely with the formula $Cu_2(Si,C)O_4,Cu(HO)_2$. Occurrence: In the Calumet & Arizona mine, Bisbee, Arizona, the mineral always surrounding cuprite as a black band and being overlaid in turn by green copper silicate and copper carbonate.

MILANTERITE. $(FeCu)SO_4+7H_2O$. A sulphate of iron and copper, in which the latter has partly replaced the iron. Carries 10% to 16% cupric oxide.

MIXITE. A hydrous basic arsenate of copper and bismuth, of doubtful formula. Carries about 44% cupric oxide.

MOHAWKITE. $(CuNiCo)_3As$. An arsenide of copper, nickel and cobalt. No natural crystals have been found, but artificial crystals, hexagonal, have been produced by synthesis by Dr. G. A. Koenig, the discoverer of mohawkite. Constituents by weight: Copper, 63% to 69%; nickel, 3% to 7%; cobalt, 0.5% to 2%; arsenic, about 28%, with more or less silver replacing copper. Cleavage: Indistinct. Fracture: Uneven. Tenacity: Slight. Hardness: 4. Gravity: 8.05. Color: Gray on fresh fractures, tarnishing to purple or brassy yellow. Streak: Gray. Opaque. Soluble in nitric acid. Occurrence: In a fissure vein, in considerable quantities, at the Mohawk mine, Keweenaw county, Michigan.

MOHAWK-WHITNEYITE. Cu_9As. Carries 83% to 87% copper. Is a mere name of convenience for an intimate blending of mohawkite and whitneyite, or keweenawite and whitneyite, rather than the name of a distinct mineral. Blending is indistinguishable to the eye, but is determined chemically. Malleable; only a little less so than copper. Cleavage: None. Fracture: Hackly. Hardness: About 5. Gravity: 8.6. Color: Gray, with yellow tinge, tarnishing to coffee brown. Streak: Gray. Opaque. Soluble in nitric acid with small residue of gray powder. Occurrence: At Mohawk mine, Keweenaw county, Michigan.

MOUNTAIN BLUE. Azurite.

MOUNTAIN GREEN. Malachite.

MYSORIN. An impure malachite from Mysore, India.

NAMAQUALITE. A hydrated oxide of copper, aluminum, manganese, calcium and silicon, with 44.75% cupric oxide. From Namaqualand, South Africa.

NANTOKITE. CuCl. A simple chloride of copper. Copper 84.1%, chlorine 35.9%. Isometric; granular; massive. Cleavage: Cubic. Fracture: Conchoidal. Hardness: 2 to 2.5. Gravity: 3.9. Luster: Adamantine. Colorless to grayish white. Transparent to translucent. Soluble in nitric or hydrochloric acids and in ammonia. Gives off chlorine when struck a sharp blow. Oxydises readily on exposure to atmosphere. Occurrence: Carmen Bajo mine, Chile.

NOHLITE. A frightfully complex niobate of zirconium, uranium, yttrium, erbium, cerium, iron, calcium, manganese and copper; latter less than 1%. From a feldspar quarry in Nohl, Sweden.

OCTAHEDRAL COPPER ORE. Cuprite.

OLIVENITE. $4CuO, As_2O_5, H_2O$. Carries about 44.8% copper. Common name: Olive green copper ore. Orthorhombic; crystals prismatic, acicular; also globular and granular. Fracture: Conchoidal to uneven. Brittle. Hardness: 3. Gravity: 4.1 to 4.4. Luster: Adamantine to vitreous. Color: Olive green to blackish green. Subtransparent to opaque. Soluble in nitric acid.

ORILEYITE. Probably $(Cu_2Fe)_3(As, Sb)_2$. A stibio-domeykite in which iron has partly replaced copper; found in Burmah.

PARAMELACONITE. Apparently a duplex oxide of copper, assaying about 85% cuprous oxide and 13% cupric oxide.

PEACOCK ORE. Bornite. Name sometimes applied to chalcopyrites showing iridescent tarnish.

PELOCONITE. A variety of cupreous manganese.

PENTLANDITE. A sulphide of iron and nickel, carrying varying amounts of copper in small percentages.

PERCYLITE. Chemical formula probably $PbCuO_2H_2Cl_2$. Copper about 17%. Hardness: 2.5. Color and Streak: Sky blue. Occurrence: South Africa, Mexico, Chile, Bolivia.

PHILLIPITE. Formula approximately $CuSo_4, Fe_2(SO_4)_3 + O?H_2O$. A hydrous sulphate of copper and iron.

PHILLIPSITE. Bornite.

PHOSPHOCHROMITE. A phospho-chromate of copper and lead, containing 4.57% to 7.36% cupric oxide.

PILLARITE. An aluminous chrysocolla.

PIRITAS FERROCOBRIZAS. Spanish for iron-copper sulphides.

PISANITE. $(Fe, Cu)SO_4 + 7H_2O$. An iron sulphate in which part of the iron has been replaced by copper.

PLUMBOCUPRITE. Cuproplumbite.

PLUSH COPPER. Cuprite.

POLYBASITE. A sulphide of silver and antimony in which copper replaces part of the silver.

PRASINE. A varietal form of ehlite, carrying arsenic, silica and alumina.

PSEUDOLIBETHENITE. A hydrous libethenite.

PSEUDCMALACHITE. $6CuO,P_2O_5+3H_2O$. Carries about 56.5% copper, 21.2% phosphorous pentoxide. Color: Dark emerald green. Greatly resembles dihydrite in chemical composition and characteristics.

PSITTACINITE. A phospho-arseno-vanadate of lead, copper, zinc and iron, with occasional cobalt. About 16% to 18% cupric oxide.

PURPLE COPPER ORE. Bornite.

RABDIONITE. A hydrated oxide of iron, manganese, aluminum, copper and cobalt, with about 14% of cupric oxide.

RED GLASSY COPPER ORE. Cuprite.

REDRUTHITE. Chalcocite.

REGNOLITE. $Cu_7As_2S_{12}$. About 33% copper, also silver, iron, zinc and trace of lead. Tetrahedral crystals. Associated with sandbergerite, which it greatly resembles. Occurrence: Cajamarca, Peru.

REZBANYITE. Cupriferous cosalite. A sulphide of lead and bismuth, carrying 1.5% to 4% cupric oxide, with some silver and a trace of zinc. Occurrence: Rezbanya, Hungary.

RIONITE. A varietal form of tennantite, carrying antimony, bismuth, iron, silver and cobalt.

RUBY-COPPER. Cuprite.

RICKARDITE. A telluride of copper. Cu_4, Te_3. Probably one molecule of cuprous telluride and two molecules of cupric telluride, Cu_2Te $2CuTe$. Constituents by weight: Copper, 40.51%; tellurium, 59.49%. Massive. Fracture: Irregular. Hardness: About 3.5. Gravity: 7.54. Color: Brilliant purple, rivalling bornite tarnish, even on a fresh fracture, and showing deep color when pulverized. Fusible: On charcoal. Soluble: In nitric acid. Occurrence: Good Hope mine, Vulcan, Colo., in vein of pyrite carrying native sulphur and native tellurium, rickardite occurring as lense-shaped masses rather intimately associated with masses of native tellurium, latter being of unusual size, sometimes nearly 3 inches. Identified late in 1902 by W. E. Ford. Is the first telluride of copper discovered, and shows an interesting resemblance to the selenide of copper.

SANDBERGERITE. A tennantite-tetrahedrite carrying about 2.4% iron, 7% to 8% zinc and 3% lead.

SCHWARTZITE. A tetrahedrite carrying 15% to 17% mercury, with small percentages of iron and zinc.

SERPIERITE. A basic hydrous sulphate of zinc, chemical formula uncertain, carrying a small percentage of copper.

SIEGENITE. The nickeliferous variety of linnaeite, sometimes carrying small percentages of copper.

SMALTITE. Empirically $CoAs_2$, but always found to carry iron, nickel and copper as well as cobalt. See chloanthite for further reference to diarsenides and arsenides of copper and associated metals.

SOMERVILLITE. $CuSiO_3$, $4H_2O$. Same as chrysocolla except carrying double the water.

SPANGOLITE. A highly basic sulphate of aluminum and copper. Cu_6, $AlClSO_{10}$, $9H_2O$. Carries about 59.5% cupric oxide.

SPANIOLITE. A tetrahedrite carrying mercury.

SPEISS. An alloy of copper with arsenic.

STANNITE. Perhaps Cu_2S,FeS,SnS, in which the iron is partly replaced by zinc. Carries about 29% copper, 25% tin and 28% to 29% sulphur, with iron 6% to 13.5% and zinc 1.7% to 9.7%.

STIBIODOMEYKITE. $Cu_3(AsSb)$. An antimonial domeykite. No natural crystals have been found; artificial crystals made by Dr. Koenig are hexagonal. Cleavage: None. Fracture: Irregular and uneven. Tenacity: Very slight. Brittle. Hardness: 4. Gravity: 8.1. Luster: Metallic. Color: Gray, with yellow tinge, like domeykite. Streak: Gray. Opaque. Soluble in nitric acid, with small residue of gray powder. Occurrence: At Mohawk mine, Keweenaw county, Michigan.

STROMEYERITE. Sulphide of silver and copper $(Ag, Cu)_2S$, carrying about 52% silver and 31% to 34% copper.

STUEBELITE. A complex silici-hydrochlorate of aluminum, iron, manganese and copper, found on the island of Lipari, Italy. As determined, carries 15.25% cupric oxide.

STUDERITE. A varietal form of tetrahedrite carrying arsenic, iron, zinc, silver, lead and bismuth, in addition to the antimony, copper and sulphur found in the nominally perfect tetrahedrite.

STYLOTYPITE. $3(Cu_2,Ag_2,Fe)S$, Sb_2S_3. Copper 28.3%, antimony 31.3%, silver 8.1%, iron 7.3%, sulphur 25%. Orthorhombic. Fracture: Imperfectly conchoidal. Brittle. Hardness: 3. Gravity: 4.8. Luster: Metallic. Color: Iron black. Streak: Black. Fusibility: Decrepitates and fuses readily on charcoal. Occurrence: Copiapo, Chile.

SUB-OXIDE OF COPPER. Cuprite.

SYCHNODYMITE. Essentially $(CuNiCo)_4S_5$. A compound sulphide of copper, nickel and cobalt. Carries 17% to 19% copper, 35% to 36% cobalt and 3.5% to 6% nickel.

TAGILITE. $4CuO$, $P_2O_5+3H_2O$. Carries about 49% copper. Monoclinic; also spheroidal concretions with structure fibrous to earthy. Luster: Vitreous. Color: Verdigris to emerald green. Subtranslucent. Soluble in nitric acid. Occurrence: Russia and Chile.

TALLINGITE. $Cu_5(OH)_8Cl_2+4H_2O$. Copper about 64%. A hydrated copper cholride. Sub-crystalline. Hardness: 3. Gravity: Approximately 3.5. Color: Greenish blue. Streak: White. Subtranslucent.

TENNANTITE. Gray copper ore. $Cu_8As_2S_7$. Copper 57.5%, arsenic 17%, sulphur 25%. The many varietal forms of this mineral are brought about by the replacement of copper with bismuth, lead, silver, zinc, iron.

mercury, nickel, cobalt, tin and platinum. Isometric; tetrahedral, also massive; granular, coarse or fine; compact. No cleavage. Fracture: Subconchoidal. Brittle. Hardness: 3.5 to 4.5. Gravity: 4.4 to 5.1. Luster: Metallic. Color and Streak: Flint gray to iron black. Opaque to subtranslucent in small splinters. Fusibility and Solubility: Same as tetrahedrite. Occurrence: At many points.

TENORITE. CuO. Cuprous oxide. Common names: Black copper; black oxide of copper. Copper 79.8%, oxygen 20.2%. Monoclinic; earthy; massive, pulverulent. Fracture: Conchoidal to uneven. Hardness: 3 to 4. Gravity: 5.8 to 6.25. Luster: Metallic. Color: Steel gray in flakes, dull grayish-black when massive. Soluble in nitric and hydrochloric acids. Occurrence: Italy, Tennessee, Lake Superior, etc.

TETRAHEDRITE. Gray copper ore. $Cu_8Sb_2S_7$. Greatly variable, shading into tennantite. Copper 52.1%, antimony 24.8%, sulphur 23.1%. This mineral is of protean form, frequently having a part of its copper replaced by iron, silver, mercury, zinc, lead, cobalt, nickel, tin and platinum. Isometric; tetrahedral; also massive; granular, coarse to fine; compact. No cleavage. Fracture: Subconchoidal to uneven. Brittle. Hardness: 3.5 to 4.5. Gravity: 4.4 to 5.1. Luster: Brilliant metallic. Color: Flint gray to iron black. Streak: Grayish brown to cherry red. Opaque in quantity: occasionally subtranslucent (cherry-red) in very thin splinters. Fusible on charcoal. Soluble in nitric acid. Occurrence: Cornwall, Germany, Peru, Chile, Bolivia, Arizona, Nevada, etc.

TILE ORE. A mixture of atacamite and cuprite with hematite and earthy material.

TORBERNITE. $CuO, 2UO_3, P_2O_5, 8H_2O$. Uranium mica. A hydrous phosphate of copper and uranium, frequently carrying arsenic. Carries 8% to 9% cupric oxide and 59% to 62% uranic oxide.

TRICHALCITE. $Cu_3, As_2O_8+5H_2O$. Carries about 34% copper. In radiated groups, columnar; also in dendritic forms. Hardness: 2.5. Luster: Silky. Color: Verdigris green. Soluble in hydrochloric acid. Occurrence: Turginski mine, Russia.

TRIPPKEITE. An arsenite of copper. ?CuO, As_2O_3. Found in druses.

TURQUOISE. A gem stone (hydrous phosphate of aluminum) colored by 2% to 8% cupric oxide.

TYROLITE. $5CuO,As_2O_5,9H_2O$. Cupric oxide about 50%.

UMANGITE. A selenide of copper, formula Cu_3Se_2. Carries 54% to 56% copper.

URANIUM MICA. Torbernite.

URANOCHALCITE. A hydrous sulphate of uranium and copper, formula undetermined, carrying about 6% to 7% cupric oxide.

VALLERITE. A mineral containing copper, sulphur, iron, alumina, magnesia and water. Color resembles pyrrhotite. Very soft. Occurrence: At Nya Kopparberg, Sweden.

VARIEGATED COPPER ORE. Bornite.

VAUQUELINITE. Phosphochromite.

VELVET COPPER ORE. Cyanotrichite.

VENERITE. A hydrous silicate of aluminum, iron (both protoxide and sesquioxide), magnesium and copper. As determined carries about 15.25% cupric oxide.

VERDIGRIS. Copper carbonate. Formed from the metal by carbon dioxide assisted by moisture in the air.

VESZELYITE. A hydrous phospho-arsenate of copper and zinc. Percentage of cupric oxide about 37.4%.

VOLBORTHITE. A hydrous vanadate of copper, barium and calcium. Cupric oxide about 38.4%.

WARRINGTONITE. A varietal form of brochantite.

WHITNEYITE. Cu_9As. About 85% copper. Massive; crystalline; granular. Malleable. Hardness: 3.5. Gravity: 8.4 to 8.6. Luster: Submetallic. Color: Grayish white, tarnishing to bronze or brownish black. Slightly iridescent. Opaque. Soluble in nitric acid. Occurrence: Houghton county, Lake Superior, Sonora, Mexico, and Chile.

WINKLERITE. A highly complex hydrated carbo-oxy-arsenate of copper, cobalt, nickel and calcium, from Almeria, Spain; carrying about 15% in cupric oxide.

WOOD COPPER. Olivenite.

WITTICHENITE. Cu_3BiS_3. Copper 38.4%, bismuth 42.1%, sulphur 19.5%. Orthorhombic, massive and disseminated, also coarse columnar. Fracture: Conchoidal. Hardness: 3.5. Gravity: 5. Color: Steel gray to tin-white, tarnishing to pale lead gray. Streak: Black. Decomposes easily on charcoal. Soluble in nitric or hydrochloric acids. Occurrence: At Wittichen, Baden, Germany.

WOLFSBERGITE. Chalcostibite.

WOODWARDITE. A complex sulphate of copper and aluminum, carrying 47% to 49% cupric oxide and 13% to 19% aluminum sesquioxide.

YPOLEIME. $5CuO, 2P_2O_5+5H_2O$. A hydrous phosphate of copper of the pseudomalachite series.

ZEUNERITE. An arsenate of copper and uranium corresponding to the phosphate torbernite. Carries about 7.5% cupric oxide.

ZINKAZURITE. A mineral from the Sierra Almagrera, Spain. Essentially a hydrous sulphocarbonate of zinc and copper.

ZINKENITE. A sulphide of lead and antimony in which copper or silver sometimes replaces lead to a trifling extent.

ZIPPEITE. A hydrous sulphate of uranium and copper, carrying about 5% cupric oxide.

ZORGITE. A selenide of copper and lead, formula variable, giving 4% to 15.5% copper and 41% to 60% lead, with traces of silver, iron and mercury.

CHAPTER IV.

METALLURGY OF COPPER.

Upon this topic many volumes have been written, all of more or less value, some few dealing with the entire subject, while the majority treat of a portion only. It is manifestly impossible to thoroughly cover the entire metallurgy of copper in the limits of a single chapter, yet I have attempted, conscientiously, to review the subject, briefly but fairly, giving to each topic its just proportion of attention, and to set forth in this chapter a very short but connected and logical account of the principal features of the various processes of copper reduction. To those desirous of going deeply into the matter I can but advise careful perusal of the works of Peters, Eissler, Douglas, and others who have written exhaustively of the various branches of the reduction and smelting of copper.

The metallurgy of copper is divisible into three principal groups, these bieng pyro-metallurgy, hydro-metallurgy and electro-metallurgy—the three kingdoms of fire, water and electricity. All are more or less closely related and interdependent. Copper secured by the various wet processes must be refined by fire or electrolysis, or possibly both. The production of commercial copper by heat alone is possible, and fire is the sole element used in the purification of the native copper of the Lake Superior district. Electrolysis refining is in general use for refining crude coppers containing high values in gold and silver, and for freeing the metal from more deleterious elements.

A brief glance at the history of copper production may not be out of place. The smelting of copper must have begun at an early date, as copper and bronze have been found in tombs and disinterred cities of very great age. The copper must have been smelted, because the ancients possessed no mines of the native metal. The process of smelting was never lost and was handed down from generation to generation, from Egyptian through Roman to modern times. One of the Swansea smelters dates back from the Sixteenth century and was preceded by others of which there is little or no record. The Welsh and English were the first to engage in copper smelting as an independent industry, the practice from time immemorial having been to smelt the ore at or near the mines. As a result of the establishment of independent works that bought ore from many mines, the Welsh smelters progressed more rapidly in metallurgical knowledge than their competitors and gained great skill in handling refractory ores. As a consequence Swansea became the seat of the greatest diversified smelting industry on the globe, and the location of the city being favorable for the receipt of ore and matte consigned from foreign countries, the industry has flourished for several centuries, but of late years has declined in importance, owing partly to the tendency toward refining ores as near as possible to the mines, which is but a recurrence to the ancient practice. The decadence of the Welsh smelting industry has also been aided, beyond doubt, by the arbitrary restrictions placed on shippers until very recently.

The Swansea smelters at the height of their prosperity drove hard bargains with producers. For a ton, 21 hundredweights were demanded, and received. An allowance of 3½ pounds on 3 hundredweights was exacted for "draftage." Allowances were also claimed for moisture. No new smelters have been built at Swansea since 1867, though perhaps 75 per cent. of the world's copper output was smelted there at a period about the middle of the Nineteenth century. The Welsh port still continues as the most important independent smelting point of the world, but, for the reason that the reduction of ores can now be accomplished more cheaply near the mines in most cases, can never regain its lost prestige in the copper trade.

The first smelters in the United States were probably primitive affairs, of small capacity, built late in the Eighteenth century, but the first American smelter of which there is an authenitc record was blown in at Taineston, Maine, in 1836. The first successful American smelter was built at Baltimore in 1845, and became the nucleus of what is now one of the most important metallurgical plants of the United States. A year or two later a small smelter was built at New Haven, and from this primitive plant dates the great copper and brass manfacturing industry of the Naugatuck Valley of Connecticut. At about the same period a smelter was erected at Bergen Point, New Jersey, the precursor of the present vast works at Perth Amboy and other points on the Jersey shore. A smelter was erected at Pittsburg in 1848, and about 1850, smelting plants were built at Cleveland, Detroit, and Hancock. Smelters were built at Ducktown, Tennessee, in 1854, and since that time the process of the copper smelting industry in the United States has been steady.

In Europe there were copper smelters at very early periods in Germany, Sweden, Austria and elsewhere. At the beginning of the Eighteenth century in addition to an already extensive copper industry in Wales, there were smelters at two points in Cornwall, also in Yorkshire, Lancashire and Staffordshire, the last named works remaining in operation until 1890. There were also smelters near the principal mining centers of Germany, Austria, Hungary, Sweden, Norway, Italy, France and Russia, while in Japan and China primitive smelting operations were carried on at a number of points, and it is certain, though lacking detailed accounts, that copper was being mined and smelted, in a small way, in India, Persia, and other partially civilized countries. Copper was also secured to some small extent from the refining of the cupriferous silver ores of Bolivia, Chile and Mexico.

With the opening of many new mines during the fourth and fifth decades of the Nineteenth century, when Lake Superior, Chile, South Africa and Australia became prominent as producers; smelters, usually of crude pattern, were built at and near the mines, in many of the newer districts. The smelting of copper has now become a world-wide industry, and few of the leading copper producing countries are without large and well-managed works. The margin of profit is now so small, and the cost of transportation so great, that the larger producers are forced to produce at least the cruder forms of copper, ranging from matte to blister copper, at the mines, or near them.

Before treating of the various smelting processes, reference may be made to the impurities found in copper, with which the smelter must contend in his efforts to secure a product of good commercial quality. These impurities vary greatly in number and extent, in the ores of various districts.

Bismuth is the worst enemy of copper, and its most insidious foe. It is eliminated with difficulty, and one-fiftieth of one per cent. will cause red-shortness, while one-twentieth of one per cent. will cause cold-shortness. Bismuthiferous ores of copper are rarely smelted, except when carrying large quantities of silver, but bismuth is frequently found in ores where it apparently has no business appearing.

Arsenic, like iron, is found in nearly all brands of commercial copper It slightly diminishes electrical conductivity, but under one per cent. does not seem to affect ductility.

Lead, next to bismuth and arsenic, is the worst impurity in copper. One-half of one per cent. will make the metal cold-short, and one per cent. will ruin copper for all purposes except casting, for which use the lead is a positive advantage, as it prevents the porosity so frequently found in cast copper.

Antimony, like iron and arsenic, exists in most commercial copper, but is usually found in small percentages. It lowers electrical conductivity, but under one-half per cent. does not seem to affect ductility.

Sulphur, frequently found in excess in poorly refined copper, reduces conductivity and ductility when present to the extent of one-fourth per cent., and one-half per cent. causes cold-shortness.

Zinc forms an alloy with copper, and in considerable quantities lessens ductility, but does not greatly affect electrical conductivity. Zinc is greatly disliked by copper smelters, and a penalty is charged for smelting ores high in this element. Many otherwise promising copper deposits are unworked because of the excess of zinc, which is eliminated with difficulty. In this connection attention is directed to the successful work being done at the Pride of the West mine, in Arizona, where copper and zinc ores are secured separately by successive concentrations.

Tin, in small quantities, does no particular damage, but materially lessens ductility when present to the extent of one per cent. or more.

Iron is found in practically all copper, except that which is chemically pure, in quantities ranging from a trace up to appreciable percentages. It seems to form an alloy with the copper, and while reducing conductivity does not injure the copper otherwise, unless existing in unusual quantities.

Nickel, in small percentages, is a common impurity. It has apparently about the same effect as iron, to which it is related, and beyond a slight reduction in conductivity has no apparent bad effect.

Silicon, even in fractional percentages, causes a marked decrease in electrical conductivity, but up to 2 per cent. does not affect ductility. Three per cent. causes brittleness, and above 5 per cent. the metal is rendered too brittle for any ordinary use.

Phosphorus, in the minute quantities usually found in copper, has no particularly bad effect, but one-half of one per cent. will cause red-shortness.

Tellurium, even in minute quantities, produces red-shortness and cold-shortness, though not greatly affecting conductivity or ductility.

Carbon, in the form of carbon dioxide, may be absorbed by copper at a critical pitch of the metal, and produces porosity, though apparently having no other effect. This, or other gases, absorbed by the copper when in a molten state, are let out as the metal sets, thus producing a more or less porous structure.

A peculiar feature of cuprous oxide is that it will melt, at red heat, without decomposition, and frequently becomes a component of the refined metal. Cupric oxide, in small quantities, has no apparent effect on the metal, but in quantities of one-half per cent. or more lowers ductility, though not injuring the metal in other respects, even if present in quantities up to ten per cent.

In the various processes of smelting, a variety of semi-metallic compounds are formed before the metal itself is produced. The first product of fusion is known as matte, or regulus. It is difficult to define copper matte, because it may contain greatly varying proportions of any of its elements, and a considerable variety of elements, of which copper and sulphur are necessary, while iron, arsenic, and a long list of impurities, valuable and damaging, are found in greater or less number and percentages in various mattes. Matte may contain as little as 15 per cent. of copper, or as much as 70 per cent., though usually ranging from 25 or 30 per cent. in the lower grades up to 50 or 55 per cent. in the higher. The tendency of modern practice is away from the old plan of blowing up the matte to blister copper by easy stages. In the most modern plants the matte is blown up to blister copper in two or three fusions from the calcined ore. Copper matte is variously considered as an alloy, a chemical compound, or a mechanical mixture. It is obviously a semi-metallic product, possessing certain of the characteristics of metal, such as malleability, which is quite marked in the case of some high-grade mattes.

Blue metal is a high-grade matte, carrying 60 to 65 per cent. copper. White metal is a matte running 70 to 75 per cent. copper, and pimple metal carries 80 to 85 per cent. copper. Black copper is impure metallic copper carrying 1 to 5 per cent. sulphur, besides sundry metals and metalloids formerly going away in the slime sands. The mineral produced by the Lake mills now ranges from 50 to 85 per cent. metallic copper. Many of the big mills make several different grades of mineral, varying in richness as well as in size of the nodules of metal. There is more or less hand-picking of the coarser grades of mineral for particles of silver, and a small percentage of the refined copper turned out is treated electrolytically, to save the silver that would otherwise be lost. The Lake copper carries no gold.

The smelting of Lake copper is done in blast furnaces, often of considerable size. The crude mineral is charged in the furnaces with fuel, usually anthracite coal, though coke is used at a pinch, and limestone for flux. The product of the first fusion comes as impure copper and cupreous slags, the latter being resmelted. The crude copper is refined by a successive smelting. The refined copper always contains more or less silver, with traces of iron, arsenic, etc. Commercial brands of Lake copper are always less pure, chemically than high-grade electrolytic copper, but the Lake product possesses superior ductility and is especially desirable for wire-drawing and similar uses.

The great bulk of the world's copper supply comes from sulphide ores. While leaching processes are employed at many mines, the greater part of the sulphide ores is reduced by heat alone, and in such cases it is desirable that as much as possible of the sulphur be eliminated before the ore goes to the smelter, unless the system of pyritic smelting be employed. To accomplish the partial oxidation of the sulphur in sulphide ores, such ores are given a preliminary roasting or calcination. This may be accomplished by heap-roasting in open air, or by roasting in stall, shaft or kiln furnaces. Heap-roasting on a large scale causes the destruction of vegetation for several miles away, because of the fumes of sulphurous and sulphuric acid driven off.

The processes of heap-roasting, while identical in the main, differ greatly in almost every detail of practice. It is perhaps applied most successfully at the Rio Tinto mine, where the heaps are of enormous size, and are burned with a marvelously small amount of carbonaceous fuel. At this mine hand-selected rich ores, averaging 8 to 10 per cent. copper, are piled in heaps of about 400 tons, and fired with a single cord of wood, such heaps burning 6 to 9 months each. The time ordinarily required for roasting an average heap is 30 to 90 days, 60 days being perhaps a fair average. The ground for a roast-heap cannot be prepared with too much care. Allowance should be made for sufficient slope to provide good drainage, and ditches should be dug to carry off rain water, and also to divert the drainage of adjacent ground, as a large proportion of the metallic values may be leached out by water in a short time. The ground is usually surfaced with broken rock or slag, and given a final top-dressing of clay, well rolled or pounded. Above this should be placed a layer of fines, three to six inches deep, to prevent baking of clay and its inclusion with the roasted ores, when the latter are removed. On this surface of fines the roast-heap proper is built. There is a first layer of wood, much or little according to the nature of the ores, and usually more than is really needed. The worst wood available will do very well, if care is taken to furnish a little good wood for kindling the fire-Channels are provided, so that after the wood has burned out there is draught through the heap. Chimneys of boards are built at various points, the number of channels and chimneys depending on the size of the heap. In American practice a cord of wood is used for an average of 30 to 50 tons of ore, the percentage of fuel growing less as the size of the heap is increased. The first layer of ore is of coarse lumps, 2 to 6 inches in size, or even larger, surmounted by a layer of "ragging," or medium-sized lumps, and topped with a layer of fines. The greater the percentage of sulphur, the lower the height of the pile. The shape of the heap on the ground may be square or oblong, usually the latter, to facilitate upbuilding and removal. In a roast yard it is necessary to have a considerable number of heaps, so that the process may be continous. The heap is fired, after building, and the wood gradually kindles the sulphur in the ore which continues to burn for many weeks. The success or failure of the process depends mainly upon careful handling, the heap requiring a small but steady supply of air, for even roasting. Too much air allowed to enter the heap will result in matting part of the ore. Heap-roasting requires a great deal of hand-labor, and has various objectionable features, which restrict its use.

Ores are also roasted in kilns and in stall and shaft furnaces. A stall furnace is merely a perfected form of heap-roasting, wherein brick, stone or slag-block walls are built about the roast-heaps, regulating the air currents. At times a cover is built above, thus preventing the access of rain-water, which would quickly leach out a large part of the copper values. In the most modern forms of stalls, paved or grated floors are added, and stalls grade into furnaces by the addition of flues and chimneys for the carrying off of the roast-gases.

The fumes of sulphur from roast-heaps are very objectionable, and also wasteful. Such fumes can be kept from the air and utilized in the making of sulphuric acid, by passing through lead-lined acid chambers, in which the acid fumes are taken into solution by water. Shaft-furnaces are especially used where the fumes are saved for the manufacture of acid. The Gerstenhoefer is perhaps the best-known form of shaft furnace. This consists of a vertical shaft with a mechanical device for feeding the charge from above, and the fresh, pulverized ore, is intercepted in its downward progress by projecting ledges, thus permitting its partial oxidation. Kiln-roasting is also employed where sulphurous fumes are saved for acid making, the kilns being of shaft-like form. This process has the advantage of permitting a much more complete desulphurization than is possible in heap or stall-roasting. Matte is sometimes heap-roasted, requiring several successive burnings. The practice is of doubtful utility, unless in exceptional cases.

The roasting of sulphide copper ores may be reducing or merely oxidizing in nature. The calcination of copper ores is an apparently simple process but in practice requires nice discrimination and great care to secure the best results, owing to the varying proportions of copper, sulphur, iron and other elements found in the raw ores. The skill and care with which the calcining is done greatly affect the costs and success of the future processes of reduction. As the combinations of ores and requirements are almost innumerable, the practice in one district is usually more or less different from that of another, and even mines in the same district do not always perform their calcining in a precisely similar manner. Securing the best possible results in each case calls for individual treatment by a metallurgist skilled in practice as well as in theory—and more especially one skilled in practice.

Calcining may be performed in hand furnaces, but automatic devices are more economical, and are in general use in all but the smallest and least modern works. Hand reverberatory furnaces with a hearth heated by a fireplace separated from the furnace by a bridge-wall with side openings, give as good satisfaction as can be secured with hand furnaces. Muffle furnaces are sometimes used. These give a very equable heat, but are expensive in operation and not generally used. There are various forms of cylinder calciners, among the best of which is the Douglas muffle cylinder calciner, with continuous discharge. This has a central flue of tile, which takes combustion products direct to the chimney. This is suited for general work, but is especially adapted for the economical and cleanly saving of sulphurous fumes for the making of acid. Hand-power cylinders are occasionally found in use, but are as expensive and wasteful as hand-power apparatus of any sort, where mechanical means can be found for doing the work. The Brueckner automatic intermittent discharge cylinder has a greater diameter and shorter length than other varieties of cylinders, and is in more general use than the other varieties, as it takes less floor space and is automatic and efficient in operation.

The principal form of calciner is the automatic reverberatory, of which there are a number of patented varieties, all of more or less value. These consist essentially of stationary reverberatory furnaces, through which plows are dragged to rabble the calcining and remove the calcined ore. One of the best forms is the turret furnace, in which horizontal revolving plows are actuated from a central shaft, while the ore charge is fed automatically from hoppers above. The turret furnace is economical of floor space and attendance, and may be built double or triple decked, if desired. In calcining ores a certain amount of copper is volatilized, and carried off with the roast gases, but in all modern plants such copper is saved in dust chambers, where it is deposited and whence it is afterward removed and smelted. As flue dust is usually high in arsenic and antimony, volatile elements that are highly deleterious to finished copper, flue dust is commonly smelted by itself, though sometimes mixed with matte.

The fuels used in smelting copper are of considerable variety, and depend somewhat upon availability and price, as well as local requirements. Anthracite and bituminous coal, coke and charcoal are used. Coke is in most general use, while charcoal is usually obtainable at more remote points only. Anthracite coal is a very good fuel for most purposes, but unobtainable at reasonable prices in the majority of districts, while bituminous coal is the most objectionable fuel, and, next to charcoal, the least used, though there is such a great difference in the nature of soft coal that some varieties work well in partial or complete fuel charges, while others give most abominable results. Gas is also used at a few points, and seems suited for reverberatory furnace work. There seems no good reason why petroleum, properly sprayed, should not serve the same purpose. The nature of a charge placed in a furnace necessarily depends, first, upon the available ores, and secondly, upon the nature of the principal ores requiring smelting. In practice it is desirable to blend various copper ores, where the necessary grades can be secured, rather than to add barren fluxes, but this is, of course, a matter depending upon the availability of the ores desired. One of the secrets of the success of the big custom smelters is found in their ability to mix various ores from different districts so as to lessen or entirely eliminate the use of barren limestone or iron ore for fluxing. The use of "sweeteners" is to be commended, where such ores are obtainable at reasonable prices. Ferruginous ores are required for mixture with silicious ores. Local conditions regulate practice, and the soundest theories must often step aside in the presence of prohibitory freight rates; and high freight rates are common in many of the greatest copper producing districts of the world.

Furnaces for the smelting of copper ore are of two classes, the blast furnace, which has a powerfully reducing atmosphere, and the reverberatory furnace, where a reflected flame gives a neutral atmosphere. The blast furnace is a device so ancient that the date of its invention is unknown. In its crudest form it is but an oven in which ore and fuel are placed together and air pumped in to aid in reduction. The modern improvements on the blast furnace have been in the direction of enlarged capacity and details, the central plan remaining the same as a thousand years ago. There were blast furnaces for the reduction of copper ores in existence in very early days at Eisleben, Germany; at Roros, Norway; in Atvidaberg, Sweden; at Perm, Russia, and in other parts of Europe. The development of the blast furnace to the present day size and efficiency has been accomplished by a steady succession of little improvements, covering many centuries, rather than by single strides, yet it may be said that blast furnace smelting has been improved more in the past thirty years than in the preceding five centuries.

The smelting of copper ore in a blast furnace is the process of reducing the metal from its ores or gangues by the use of carbonaceous fuel, usually coke, in an oven having a blast of air, which may be drawn direct from the atmosphere, or heated before passing through the tuyeres. This process is adapted to the reduction of practically all of the copper ores. In addition to the charge of ore, fuel and fluxing elements are added, the flux being cupriferous or barren, as circumstances may dictate. One of the greatest improvements of modern days in blast furnace practice has been the invention of the water-jacket. This was devised at the Longfellow mine, Arizona, in 1874. The smelter was 800 miles from a railroad, fire-brick cost one dollar each, and were of short life, the ore being highly basic. As it was manifestly impossible to make enough copper to pay for the furnace linings, the experiment was tried of using iron sides for the furnace, with hollow walls, through which water was circulated. This proved a success, and is now in very general use, water-jacketed cupolas being far more common at present than those with fire-brick linings. Despite the considerable loss of heat resulting from the circulation of water between the inner and outer shells, the water-jacketed cupola has proved itself both efficient and economical. Such furnaces are now built with daily capacities of 200 to 300 tons. The shells are usually circular or oval, with jackets of cast-iron, wrought-iron or soft steel, and copper is frequently used.

Reverberatory furnaces are a Welch invention, dating only from the last quarter of the Nineteenth century, and after running the gauntlet of conservatism have so effectually proven their value that their utility is no longer questioned. Reverberatory furnaces are adapted to all classes of ore, but are more especially suited for the reduction of sulphides, for which purpose they unquestionably lead the old-style blast-furnace. In the reverberatory furnace the flames from a lower grate, on which the fuel is fired, are reflected back upon the ore charge, lying on a bed above, thus giving a neutral atmosphere. The fore-hearth is brick-lined and movable, and the air entering the furnace is frequently preheated. In the best practice five to seven tons of ore are smelted per ton of fuel consumed, the larger furnaces giving the higher duty. Furnaces of this pattern having a daily capacity of 250 tons are not uncommon, and even larger have been built and operated successfully. In the case of sulphide ores it seems certain that reverberatory furnaces produce a richer matte from similar charges than do blast furnaces.

In the case of oxide and carbonate ores, the smelting is done in the same manner as previously described in the treatment of the native copper of Lake Superior. With the sulphide ores the process differs. The raw ore is roasted, or more frequently calcined, before charging in the furnaces, commonly of the reverberatory type. Under the influence of the reverberatory blast chemical reactions are set up that lead to the volatilization of a considerable portion of the sulphur, also part of the other volatile elements, such as arsenic, etc. The product of the first fusion is secured as a low-grade matte. If the charge is blown up to more than 50 per cent. at the first smelting the slags will probably show too much copper, entailing direct losses or resmelting. The old practice was to bring the low-grade matte from the first fusion up to blister copper by successive smeltings, in easy stages, but the modern practice is to bring the matte to high grade by as few fusings as possible, and the former heavy losses in slags have been minimized by close attention to details.

The "direct method" of copper refining consists essentially of the fusion of a mixture of raw and calcined matte of about white metal grade, the resultant product being blister copper.

The "reactor process," for which much is claimed, and from which much is hoped, is a patented system for the production of blister copper from mattes of all grades by a single fusion. The essential features of the process are the mixture of superheated steam and fine sand with atmospheric air, which mixture is drawn into the furnace through two or more sets of tuyeres, striking the surface of the molten charge and setting up a circular motion therein, which keeps the matte free from slag, and exerts both an oxidizing and a scorifying process simultaneously. It is claimed that gold values present in the charge will be precipitated in the first matte, and that matte ranging in tenor as low as 15 per cent. can be brought up to blister copper at a single fusion, in a very short time, and that the blister copper so obtained will range above 99 per cent. in tenor, and prove remarkably free from the impurities present in the matte, which, normally, would be expected to appear in considerable quantities in the finished product. It is evident that the inventors of this process have a wide field before them, if their claims can be fully substantiated in furnace practice.

The process of conversion first applied to steel making by Bessemer, and now in general use in the manufacture of steel, was eventually applied to copper smelting, after no little unsuccessful experimenting. The first successful plant for the bessemerizing of copper matte was built in Lyons, France, in 1881, by Pierre Manhes. This process was adopted shortly afterward at the Parrot mine, Montana, where it was greatly improved over the French practice, and from that time its general adoption for the conversion of matte into blister copper may be said to date. The process, as now in general use, consists of burning out the sulphur and allied impurities in the converters, some of which are of very great capacity, having been built as large as eighteen tons. This process is completed in one heat, and the sulphur in the matte is made to work its own destruction under the influence of the blast. The process is an economical one, but should be followed by electrolytic refining to give a pure copper of high conductivity and also to save the precious metals usually contained in blister copper.

The first converters were made of one ton capacity, but now rarely run less than ten to fifteen tons in size, in the modern smelters. The crude copper is run from the furnace into the converter in some cases, thus saving re-heating. Owing to the greater specific gravity of gold and silver the precious metals tend toward the bottom of the converter, and can be saved to some extent therefrom, but this process is so crude and wasteful that the gold and silver are now generally parted by electrolysis in a later operation.

Converters are built of steel, in various sizes, sometimes of great ca-

[illegible] The converter-shell is made in three parts [illegible] the largest part, and is lined with fire-brick [illegible] In the best [illegible] practice the copper is run direct from the cupola well or the melting furnace [illegible] the converter, thus saving loss of heat. A blast of five to [illegible] pounds per square inch, furnished by an air compressor, is then blown through the molten charge, the converter blowing off into hoods that connect with [illegible] The number and size of the [illegible] through which the blast enters the retort vary with the style and [illegible] of the converter, which is mounted on trunnions, and provided with [illegible] More or less copper, volatilized by the [illegible] and recovered as fine dust. In the best practice [illegible] converters handle full charges and [illegible] copper of better than 99 per cent. in one to one and a quarter hours.

Pyritic smelting is a process of reduction in which the sulphur in the ore, itself a valuable fuel, is made to work its own destruction. In ordinary smelting practice the sulphur must be driven off, with great labor and trouble, through the employment of carbonaceous fuel. This process is, of course, adapted solely to sulphide ores, and apparently to only a portion of these, as sufficient silica is required to hold the iron in slag. Whether siliceous ores might not be added to sulphides deficient in silica is a matter for experiment. In practice it is usually found advisable to use a little coke to start the process of combustion, but this merely serves as kindling, the real fuel being the sulphur in the ore itself, which unites with oxygen entering the furnace and passes off as sulphurous fumes, the iron in the ore also being partially oxidized at the same time. Sulphide ores occasionally require the addition of oxide ores to serve as a fluxing agent. The first cost of a pyritic smelting plant is less than that of an ordinary smelter of the common type, and as fuel is the greatest single item of cost in the operation of a copper smelter, the cost of operation is materially lower in pyritic smelting than with any other process. The cost of calcining is saved, and the cost of fuel is reduced from 60 to 80 per cent. The atmosphere is neutral, and [illegible] other smelting. It [illegible] adapted to, but it must not [illegible] advantages [illegible] system, that it will [illegible] should not be decided on in [illegible] has been had, and [illegible]

[illegible] charging the [illegible] and [illegible] gration [illegible] partially [illegible] charging [illegible] a strong hot-blast aids in the process, exercising a bessemerizing effect. When properly operated a furnace worked with a column charging gives matte of good grade, with exceptionally clean slags, has a large capacity and effects a big saving in fuel.

The scoria, or worthless waste material from a smelter, accumulates in large quantities, and its disposal is a matter of importance. Various plans are in use for handling and disposing of the slags. The simplest is to let it run outside and care for itself, but this is possible only where there is a sharp incline and plenty of waste room, conditions usually lacking. The cheapest plan is, probably, to granulate the slag. This is done by running the molten slag into a trough conveying a stream of running water. The slag granulates instantly and is washed away by the water, and deposited by gravity at whatever point desired. It may also be taken out in slag-pots, by hand, horse or mechanical power, or may be run out in gutters, while liquid. One valuable use of this material is the making of slag brick, which, while not suited to general use, are frequently available about a smelter. The chemical composition and physical properties of slag vary greatly, according to the nature of the ores and fluxes used in the smelter charges, but most slags are rich in iron and silica, and make excellent brick for certain rough uses. Whether cement might be made from copper slags is undetermined. The Illinois Steel Company makes an excellent cement from its iron slags, but the excess of iron in copper slags might impair the setting qualities of a cement made therefrom.

The hydro-metallurgy of copper is a special branch of the art, and one which has reached its highest development on the Iberian peninsula, where its use has resulted in the development of several very large mines, which, without its aid, could not be worked at a profit. The use of leaching processes implies a final blowing up of the product in a blast furnace, but in the main the work is accomplished by heap-roasting, leaching and cementation, in the case of sulphide ores. Lixiviation is especially adapted to sulphide ores of low grade, but it is not every low grade ore that can be handled advantageously by leaching, as it is not adapted to ores containing considerable quantities of the ferrous oxide, manganese or lime. The leaner oxides and disseminated sulphides having quartz gangues are especially suited to lixiviation. The great disadvantage of the process is that it is very slow, and locks up enormous quantities of ore, which means a heavy investment in unavailable ores and partly finished products, at all times.

The leaching processes vary, according to the nature of the ores, and in minor details, but may be broadly divided into three groups, one for oxide ores, one for sulphides, and one for sulphates, the latter receiving the same treatment whether produced naturally or artificially. In the case of old copper openings, the waters percolating through the sulphide ores gradually leach out the metal, which is carried in solution as sulphate of copper, and can be easily precipitated upon scrap iron. The mines of the Sierra Morena, in Spain and Portugal, have been worked intermittently for at least three thousand years, and immense piles of low-grade sulphide ores and refuse have accumulated. As these weathered, the natural lixiviation was perfected, and all that is needed to save the copper is to deposit scrap iron in the path of the leach water. Upon the iron the red metal is deposited, while the iron is gradually consumed, and turned into copperas by the free sulphuric acid set free from the leach-water. The process of securing copper from sulphate solutions is now used at many old mines, resulting in small annual production, and is employed in certain districts for saving copper from water pumped out of the mines.

The process of natural cementation is well exemplified at the San Domingos mine, Portugal. The low-grade sulphide ore is cobbed to three or four-inch size, and piled in immense heaps, 15 to 40 feet in height, which are provided with valleys for drainage, with brick chimneys at intervals. Pipes are laid over the surface of the heap, and water applied copiously at intervals. The water draining out of the heap is collected in sluices, and the metal carried in solution as copper sulphate is precipitated in metallic form on scrap iron. Such heaps may contain a million tons of ore, and require eight or ten years for leaching.

What is called artificial cementation is best exemplified at the Rio Tinto mine, in Spain. Broken ore is piled in roast-heaps, called teleras, in quantities of 1,000 to 1,500 tons to the heap, the ore ranging from one and a half to two per cent. in copper. The heaps are fired, burning slowly for three to six months, after which the ore, then thoroughly and uniformly roasted, is placed in cement tanks which are some five feet deep by one hundred feet long, and thirty-five feet wide, and provided with false bottoms of square timber. The ore is then leached, the leach water running into settling tanks, where the copper is precipitated on pig iron. There are five or six successive leachings, after which the leached ore is taken out, piled in heaps called terreros, and weathered again, for releaching. Some idea of the immensity of the scale on which the Rio Tinto is operated may be gained from the fact that the mine has about seven million tons of low-grade ore in terreros at the present time.

Copper sulphide ores are converted into sulphates in three ways. The first of these is by weathering, which induces a process of natural decomposition, as instanced in the case of the San Domingos, previously cited. The second method is that of slow-roasting, as just cited in the case of the Rio Tinto. The third system, which is employed at the Rio Tinto, and other mines, consists of roasting copper sulphides with ferrous sulphate, which converts the bulk of the product into copper sulphate. Sulphate of iron is freely produced in the cementation of copper, hence is readily available at small cost, at the Rio Tinto and other mines producing cement copper, in addition to which there is an immense supply of ferrous sulphate (copperas) produced in the weathering process preliminary to cementation, as the Rio Tinto and other Huelva ores are chalcopyrite, which is a compound sulphide of copper and iron. In the chemical reactions attendant upon weathering, large quantities of ferrous sulphate are produced, and this, after further oxidation, reacts to free sulphuric acid and basic iron salts, the free sulphuric acid attacking the copper and changing it into copper sulphate, which is held in solution and may be made into crude commercial form by evaporation of the water, or precipitated in the form of cement copper, as is desired.

Copper sulphides may also be converted into chlorides by two processes, both of which are used in the Hispano-Portuguese cupriferous fields. In the first of these processes the sulphide copper ores are treated with ferric chloride, or with ferrous chloride and hydrochloric acid. Decomposition is hastened by saturating the ores under treatment with calcium chloride (chloride of lime), or sodium chloride (common salt). The second process, which is quicker, and also gives closer extraction, though the cost of treatment is higher, consists of roasting the raw sulphide ores with a liberal addition of salt. This is known as the dry chloruration process, and is in extensive use at the Rio Tinto, where the ores receive an addition of about one and three-fourths per cent. common salt, and the mixture is roasted in teleras. The chlorurized ore is then leached in vats, as already described, and the residuum is placed in terreros for further weathering and ultmately a second leaching. A modification of this process is in use at Natrona, near Pittsburg, where residues of Spanish pyrites used in the manufacture of acid are treated by what is practically the same process, though conducted somewhat more expeditiously and expensively. The process is also in use at several Canadian and American points, on a small scale.

The Doetsch leaching process is not in present use, though once employed extensively at the Rio Tinto. This system provides for the treatment of raw sulphide ores, which are mixed dry with about one-half per cent. of ferrous sulphate and salt. The ore is broken to half-inch size, and with the ferrous sulphate and salt is built up into large heaps having channels and chimneys for ventilation. In about two years the weathering is completed, and the copper held in solution in the leach water, amounting to about 80 per cent. of the assay value, is precipitated on iron.

The earlier wet process of Langmade was improved by Henderson in 1860, and remains, with slight modifications, in quite extensive use. It is designed for the extraction of copper from the cinders of cupriferous iron-copper pyrites remaining after the extraction of the sulphur used for the manufacture of sulphuric acid.

The Hunt & Douglass process is an improvement upon the Doetsch leaching process, and while based upon the same general plan, is a modification better adapting the system to the economical work that is now necessary for the earning of profits in the copper trade.

The cement copper resulting from the precipitation of copper from cuprous sulphate solutions upon scrap iron is a very impure mixture of metallic copper with iron, antimony, arsenic, silica, etc., and is washed before reduction to blister copper in blast furnaces.

The principle of electrolysis, or the parting of metals and the redeposition of one of them by the aid of a continuous electric current, was discovered by Faraday in 1839, but was not applied practically to copper refining until 1881, when the Balbach smelting works at Newark, New Jersey, put in a small electrolytic plant. Despite the obstacles met with at the start, the process gave such promise of success in the perfect separation of copper and its allied metals that its introduction was rapid. The process was improved speedily, and three years after its first use in the United States electrolytic plants were in operation in Wales, England, France and Germany. For the refining of blister copper it has no competitor, and is now the cheapest as well as the most thorough process for the refining of all rough coppers.

The process of electrolytic refining, producing copper of that name, is a step in advance of the old methods that produced copper of merchantable grades, though containing considerable impurities, of which gold and silver, especially the latter, were the principal. It being evident that the precious metals did not add to the value of the copper, but were themselves of great value if it were possible to separate them from the copper, various plans for parting the metals were tried, but none of them were completely successful until the perfection of the system of electrolytic refining.

There are two principal systems of electrolytic refining, with a variety of modifications of each. These are known as the series and multiple systems. The former has electrodes in series and tanks in series, or, more frequently, in multiple series. The multiple system has electrodes in parallel arcs, with tanks in series. The series system requires a much greater electromotive force than the multiple plan, and the latter is in more general use. There are a dozen electrolytic refineries in the United States, and no two of them are built or conducted on exactly the same plan, though the main features of the work are similar, the modifications being principally in the minor details. The success of the entire system hinges upon the fact that under electrolytic action metals are dissolved at the negative pole of a battery, and redeposited at the positive pole, when free circulation is permitted in a favorable solution. Varying electric currents give varying effects, and some metals pass over sooner than others, copper being one of the first to go over. As the unrefined copper contains a variety of metals in most cases, it is important that the electrical current be so regulated that none of the other metals pass over at the same time as the copper, or the object of the work is defeated. Not only must the current be carefully regulated, but the nature and circulation of the electrolyte are of prime importance, in securing thorough and economical practice.

Connections between dynamos and tanks are made of high-conductivity copper, necessarily of large size to carry the heavy current used, and of varying forms in cross-section. The tanks may be of wood or slate. The wooden tanks are usually lined with lead, tarred felt, or asphalt, lead being preferable. These tanks usually have their tops about flush with the floor, to permit easier handling of material, and are terraced in series, thus providing for a natural circulation of the electrolyte, which is pumped into the upper tanks, and flows thence, by gravity, into the other tanks of the series. Overhead trolleys, running along the galleries and aisles between the tanks, provide expeditious means for bringing in the anodes and taking out cathodes, which, in a large plant, are constantly being added and withdrawn, although the making of a single cathode requires several weeks. The anode bars are cast from blister copper, usually running from 98 to 99.5 per cent. pure. These may be made at the smelter, or cast at the refinery from blister copper melted in a cupola furnace kept running for the purpose. Anodes are cast in a variety of forms,.but more commonly are thin plates with projecting lugs that rest on the top of the sides of the tanks, one lug resting on the electrical conductor, while the other is insulated.

The composition of the electrolyte varies at the different plants, containing from 5 to 6 parts of sulphuric acid, 15 to 20 parts of bluestone and 75 to 80 parts clean water. The average composition is 16 to 18 parts bluestone, and 6 parts of acid. The heating of the electrolyte promotes the process of decomposition and upbuilding, and produces a smoother deposition of copper on the cathode.

The cathode plates are made of strips of rolled copper about one-quarter inch in thickness, and of varying sizes and forms. These are made from copper sheets, then oiled and coated with fine graphite, to assist in electrical deposition. The process of refining is necessarily continuous, to secure the best results metallurgically and financially, but from two to four weeks is the average time required in making an average cathode. Including the time required in remelting and in various other uses, it may be said that five to six weeks time is required for the making of finished cathodes from the rough copper received, though a much shorter time may suffice in some plants, under exceptionally favorable circumstances. The rate of progress secured depends quite largely upon the purity or impurity of the anodes, the process of electrolysis being greatly facilitated and cheapened by comparatively pure anodes.

As the anodes are torn down and the cathodes built up under the steady effect of the powerful electric current, the pure copper, with minute traces of the impurities present in the anode, is carried over to the positive pole. The great bulk of impurities in the anode are precipitated to the bottom of the tank, as sludge, or slimes. A certain infinitesimal amount of the impurities present in the anode will find their way into the cathode, but not to sufficient extent to injure the product for any commercial use. If more than traces of the impurities are carried over, it is because the electrolyte has become foul, or the current is wrong, or there has been serious carelessness somewhere. The chemist at an electrolytic refinery earns his full salary, for he must be working every minute he is on duty, as frequent assays of anodes and cathodes, and at least tri-weekly determinations of the electrolyte are required. There are local aberrations peculiar to the process which are liable to affect any or every tank, and even individual anodes, requiring constant watchfulness from superintendent, electrician and chemist. The sludge precipitated to the bottom of the tank may form a conducting plate, giving rise to short-circuiting, and should be removed before large accumulations occur. When the electrolyte becomes too foul for proper use, it is purified, brought up to the proper standard, and pumped back into use again. The slimes at the bottoms of the tanks are siphoned or bailed out, taken to the slime tank, and copper scraps picked out by hand, after which the copper remaining therein is dissolved out by a solution of two to three parts 66 degree sulphuric acid with one part water. The remainder of the precipitate, which may contain gold, silver, tin, lead, zinc, antimony, bismuth, etc., is washed, dried, mixed with soda-ash and then smelted down to base bullion, from which the gold and silver are parted in the usual manner.

The electrolytic refining of copper has been greatly improved during the past decade, and is now in very general use. In 1892 the output of electrolytic copper was about 25,000 tons. Three years later it was 87,000 tons, while in 1898 the output was estimated at 157,000 tons, and for 1902 was probably nearly 250,000 tons—a gain of ten-fold in ten years. The process is in such general use because it serves a two-fold purpose, saving the gold and silver values which had been partially or wholly lost before its adoption, while also producing a product of uniformly high grade. Although Lake copper is best suited for certain uses, and there are other excellent brands not produced electrolytically, the fact remains that electrolytic copper is now the standard of the world, and bids fair to remain such until something akin to a revolution in metallurgy shall give us a refining process better or cheaper. The cost of refining a ton of crude copper by electrolysis varies greatly, ranging from about $10 up to probably nearly $25, with $12 to $14 as the average figures. Unlike smelting, which can usually best be done near the mine to save excessive freight charges on worthless material, electrolytic refining is performed in most cases nearer the consumer than the producer. The extra freight paid on the very small percentage of impurities in blister copper is so very small a fraction of the total transportation charge that this loss is more than offset by the advantages offered by the cheaper labor, cheaper fuel, and better transportation facilities that are found along the Atlantic seaboard in the United States, where a considerable amount of foreign copper is refined, as well as the bulk of the domestic production.

The possibility of electric smelting has long excited the interest of scientists and practical metallurgists. Various laboratory experiments have resulted well, but it is not a matter of record that any electric furnace is in successful commercial operation. Claims have recently been made that refined copper can be produced direct from mattes, or even from ore, by electrolysis. These claims remain to be demonstrated.

CHAPTER V.

The Uses of Copper.

The three indispensable metals of the present age are iron, copper and zinc. The loss of tin, nickel, lead and aluminum would be a severe blow and work great hardship, and even were we to be deprived of such apparently insignificant metals as antimony, cobalt, manganese and platinum, the industrial world would suffer a loss that would entail very disastrous consequences. The taking away of gold and silver, and that useful thief-taker, mercury, which catches most of the world's gold supply, would reduce the globe's finances to chaos. Iron and copper, however, are the main pillars of the metallic structure, while zinc, in addition to many other virtues, possesses the unique quality of being the only electrically negative metal, and without it, copper, for electrical purposes, would be like a "pair" of scissors with but one blade.

The uses of copper are many, and great industries are dependent upon this metal, which affords direct employment to some hundreds of thousands of persons, mostly skilled workman, and annually adds something like five hundreds of millions of dollars to the wealth of the world. The Stone Ages of humanity were followed by the Bronze Age, in which copper and tin were the only metals used, unless the wearing of a few gold and silver trinkets could be said to establish the use of those metals. The Age of Iron followed that of Bronze, and the Steel Age of the latter half of the Nineteenth century is but a later and higher development of the Iron Age, just as the polished stone weapons of the Neolithic Age of ethnologists indicate a period of adaptation and improvement upon the cruder weapons and implements of an earlier day. While iron and steel are not only holding their own, but gaining ground in phenomenal strides, another metal has arisen to claim at least a portion of the honors of Twentieth century civilization, and copper is the foundation of the Electric Age, just as it was the fundamental metal in the Age of Bronze, some milleniums ago.

Of the many uses of copper, electricity is easily the most important. From a plaything for philosophers, in the times of Franklin and Volta, electricity has become one of the prime factors of the life of the present day, and, unless all signs fail, the uses that we consider multifarious, and the installations that we deem immense, are but the precursors of yet better and greater things, of which we may sometimes dream, and from which unsubstantial fabric the flash of Genius and the fires of Labor will bring forth the perfect fruit, for the use of generations yet unborn. A full enumeration of the electrical uses of copper would require a volume, rather than a few paragraphs in a single chapter. The metal is an integral factor in all electrical installations, and for the transmission of power, light and telegraphic or telephonic impulses, is a necessity. The iron wires of pioneer telegraph and telephone lines are rapidly giving way to copper strands. Iron is low in electrical conductivity, making it an inefficient and costly medium for transmission. It is also subject to rust, and its lack of the ductility which is such a prominent characteristic of copper, causes iron wires to break from winds and sleets that would not injure lines of copper. Iron telegraph and telephone wires are still used to a much larger extent than generally imagined, owing to the cheap initial outlay, but the cost of maintenance and repairs renders it certain that iron must give way, sooner or later, at all points, to copper.

The electric light was the luxury of great cities two decades ago; now it is the necessity of every progressive village of so many as a thousand souls. But a quarter century gone, telephones were a scientific toy to the enlightened, and something uncanny and dangerous to the ignorant. Today a network of wires stretches across the American Continent, and Stockholm, upon the banks of the Malar, has one 'phone for every family of its population. The business man at his desk talks with his broker a thousand miles away. The Calumet & Hecla copper mine, one of the world's greatest properties, has telephones nearly a mile below the earth's surface. Timbuctoo shall have them too, before the century's past, and to the pole that's now our goal, we'll telephone at last.

Only fifteen years ago the electric railway was looked upon by conservative persons as a trumpery sort of experiment, scarcely able to deprive the long-eared mule of his appointed mission as motive power for the American street-car system. But where is the mule to-day? His bones lie whitening upon the veldt of South Africa—British South Africa now—and the street cars know him no more.

Electric heating is yet an experiment, but its day will come. Electricity must play a more and more important part in the world's manufactures, both as a motive power and a reducing agent. In the happy days of the future the struggle of coal barons with rebellious workmen will no longer distract a public desirous of fuel for hearth and workshop. In fifty years, or less, the owners of the waterfalls will be the men on whose devoted heads the vials of wrath will be poured out, for they will furnish the heat and power, and will reap the reward of great riches, with corresponding unpopularity. Great as has been the electrical development of the past two decades—and it really began in earnest only a quarter of a century ago—the future assuredly will discount the past. Power, heat and light that can be summoned by the turning of a switch, or the pressing of a button, will, of a certainty, displace the power that comes from laborious stoking; the heat that comes with delay, and much soot and smell, and leaves ashes behind; and the light that comes of striking many matches, and with the effusion of kerosene that is odoriferous. Electric power is already the cheapest form of energy, where waterfalls are used. Electric light is growing both better and cheaper. Electric heat, while dear for ordinary use, at present, will become cheaper. The use of electricity for power, heat and light must become well-nigh universal, in time.

Next to its electrical uses, copper is most extensively employed in engineering; every modern engine has brass oil-cups; brass and copper tubing is used in many boilers; brass, gun-metal, bronze and composition copper bearings are a necessity. Copper and brass boiler tubes are used in locomotives and other high type boilers, having ability to withstand enormous pressures, and being excellent conductors of heat. Copper tubes are used almost exclusively in marine condensers. Until the era of iron vessels, prudent ship-owners sheathed the hulls of their craft with copper, which kept the bottoms clean. Within the past few years this practice has been renewed, with modern steel steamers, on which it is necessary to plank over the hull below the water line, in order to give a backing for the riveting on of the copper sheets. The loss in speed, and consequent loss in time and fuel, brought about by barnacles gathering on iron and steel bottoms, is very great, and the cost of dry-docking and scraping, with loss of time entailed thereby, is probably considerably greater than the expense of wood-sheathing and coppering iron and steel vessels below the water line. Eventually some method will be devised for the plating of copper directly on the steel bottoms of the boats.

Copper is used extensively in architecture, as roofing for buildings, either in sheets or tile form, and in cornices. For the latter use copper is considerably more costly than galvanized iron, but its freedom from corrosion, and its rich appearance without painting, render it desirable for ornamental cornice work on the better class of buildings. Bronze gates and doors for churches and public buildings are highly ornamental, and the most desirable that can be made. Bronze grille work is frequently used, and its richness and permanence cause it to be regarded favorably. In builders' hardware, brass, bronze and copper locks, knobs, escutcheons, butts, bolts, catches and drawer pulls are in steadily increasing favor and use, and from the superior durability and appearance of copper and its alloys, will continue to displace iron in a greater ratio, as the nations increase in wealth and the standard of living is raised. Brass rods for portieres, curtains and stair carpets are in favor. Brass pipes and faucets, usually nickeled, are used in the best plumbing, for bathrooms and lavatories, on land and sea, and in railroad sleeping-cars. Extensive use is now made of brass rods in devices for window displays and in various mechanisms for exhibiting goods, in retail business places.

The domestic uses of copper and brass are varied. Brass beds and furniture attract by their cleanliness, beauty and durability. Brass or copper lamps, for kerosene oil, are more durable and ornamental than those of glass and other materials, and also far safer. The consumption of high grade brass piping and castings, for gasoliers and electroliers, is enormous, and constantly increasing, displacing the crude iron pipes and castings of the preceding generation. In the kitchen the brazen kettles of earlier days are losing ground. There is no material better fitted for cooking, when carefully cleaned, and none that may cause so much trouble, if neglected.

The consumption of sulphate of copper is not confined to viticulture and the electrical industries, as it is consumed by the thousands of tons monthly in the textile factories, in the chemical industries, and in manufactures of lines so varied as to make their mere enumeration fatiguing.

The question of substitution of other metals is one that comes up periodically. Aluminum is often mentioned as the metal that is to displace copper almost entirely. There is little likelihood of such a consummation, unless aluminum can be made at a fraction of its present cost. Aluminum is the most common of all metals, being the base of every clay, but it is reduced with great difficulty, and at heavy cost, by electrolysis, but it is a useful metal, with a distinct sphere of its own. Several of its alloys are of much utility, and the pure metal, owing to its lightness, is available in many places where steel and copper are less desirable. Aluminum has fair electrical conductivity, but is not apt to replace copper to any great extent for electrical uses, unless aluminum goes down and copper goes up in cost.

In lines other than electrical copper has many substitutes. These come into use when the metal is high, and go out when the cost of copper falls. Like all other commodities, copper finds its level. High prices encourage substitutions and decrease consumption in other ways, while low prices encourage the substitution of copper for other materials in many places. The true value of copper is, like the true value of all other commodities, the price at which enough metal can be produced, at a fair profit, to supply the world's legitimate requirements at a reasonable price. An era of high prices stimulates production and restricts consumption, with an eventual collapse of prices and trouble to producers. An era of low prices restricts production, stimulates demand and plainly foreshadows future grief for the consumers.

The era of copper manipulation, beginning in 1899 and ending early in 1902, was marked by unnaturally high prices, greatly restricting consumption, followed by abnormally low figures that caused the speedy absorption of the large surplus of metal previously stored up by reason of unduly high prices. The course of the metal market during 1903 was more regular and more free from manipulation than since 1898, but the suspicions of purchasers remain active. Having suffered from previous interference with the natural law of supply and demand in the copper market, it is but natural that they should fear further tactics of the same sort, and weigh the evidence at hand quite closely, before making market commitments.

The best interests of producers and consumers alike will be served by a perfectly natural market, in which the level of prices is determined by the supplies on hand and the consumptive capacity of purchasers. Copper consumers are prone to think that the abnormally high prices of 1899-1901 were secured solely at their own cost, yet as a matter of fact the producers suffered also, to no small extent, from the selfsame inflation. By reason of the unduly high prices then ruling many new mines were opened, to compete with those already developed, and their competition, brought about by the era of high prices, became effectual after prices had dropped sadly. Not only this, but the cost of producing copper advanced materially by reason of the high market price. Costs were increased, not only through higher wages paid workmen, but by reason of a general slackening of vigilance in guarding small leaks, it seeming impossible for any corporation to be as careful in good times as in an ordinary season. It has taken the better mines several years to get back, even partially, to the vantage ground of costs occupied before the era of boom prices beginning in 1898.

The year 1904 opens with the metal market in a stronger and more natural position than for several years past. It is evident that manipulative tactics are being used but slightly, if at all, and the market has found its level. Production and consumption are on practically a parity, and hardening in metal prices is to be looked for. Consumption in the United States remains heavy, though scarcely up to that of 1903, and the requirements of Europe are greater. Taken all in all, the prospects of business for copper producers are better than for several years past.

CHAPTER VI.

GLOSSARY OF MINING TERMS.

In this section of the Copper Handbook the glossary, first appearing in the 1902 Edition, has been materially amplified, and will be found to give nearly all of the terms used in copper mining, milling and smelting.

ACID. An acid rock is one in which bases are combined with acids, forming salts. The antithesis of basic.

ADIT. A tunnel. A mine opening, driven from the surface into a hill or mountain on practically a horizontal plane, only enough rise being allowed to provide for natural drainage and to allow the easy removal of cars bringing rock from the breast of the workings. An adit can be driven only where [illegible]

ADOBE. [illegible]

AIR-BLAST. [illegible] the escape of air com- [illegible]

AIR COMPRESSOR. [illegible] a pressure suf- [illegible] elsewhere at a [illegible]

AIR-DOORS. [illegible] found in the [illegible] a drift [illegible] the strong air [illegible]

AIR-DRILL. [illegible]

AIR-SHAFT. [illegible] deep work- [illegible] mine. Nature [illegible] shafts, one of [illegible] natural [illegible] The longer shaft [illegible] which the air [illegible]

[illegible] chemically, [illegible]

[illegible]

[illegible]

AMALGAM. A union of mercury with other metals, such as gold, silver or copper. Mercury will not amalgamate with iron.

AMALGAMATION. The process of uniting gold, silver or copper with mercury. The quicksilver is expelled later by heat and recovered for further use.

AMORPHOUS. Without form.

AMYGDALOID. A trap rock, of igneous origin and frequently of highly complex structure, the name coming from the little pits or amygdules of softer rock-material found therein. In the Lake Superior copper district the copper-bearing amygdaloids frequently show the native copper in the amygdules left by the leaching out of the softer rock originally contained therein.

AMYGDALOIDAL. Of the nature of or akin to an amygdaloid. Word used in England, in place of amygdaloid.

ANALYSIS. A complete chemical test of any given substance.

ANHYDROUS. Devoid of water.

ANTICLINAL. A fold of rock-strata bulging upward, in saddle-shape. The reverse, geologically, of synclinal.

ANTIMONIDE. An ore of any metal or metals chemically united with antimony.

APEX. That part of an ore vein at or nearest surface. Usually requires opposing experts and several lawsuits to determine. In case of litigation the apex is usually owned by the litigant having the most money.

APICES. Apexes.

ARASTRA. A Chilean mill. A circular trough, in which broken ore is pulverized by a revolving wheel or mill stone.

ARENACEOUS. Of a sandy nature.

ARGENTIFEROUS. Silver-bearing.

ARGILLACEOUS. Of a clayey nature.

ARROBA. A weight of varying heft. Spanish, 25.36 pounds avoirdupois. Portuguese, 32.38 pounds.

ARSENIDE. An ore of any metal, or metals, with which arsenic is chemically united.

ARSENOPYRITE. An ore of any metal or metals with which arsenic and sulphur are chemically united.

ASSAY. A chemical test of ore or metal to determine its exact content and value in any given metal or metals.

ASSESSMENT WORK. The amount of work required annually by the United States government, from the holders of an unpatented mining claim.

ATTLE. Cornish term for waste rock.

AURIFEROUS. Gold-bearing.

AUXILIARY. An auxiliary engine or machine is one kept in reserve, for use when the principal machine is idle for repairs or other reasons.

AVERAGE PRODUCE. Cornish term for percentage of copper in ore.

BACK. The roof of rock above any mine opening driven on a horizontal plane.

BAD AIR. Air in which miners cannot work, due to powder fumes, noxious gases or insufficient ventilation.

BAL. Cornish name for a mine.

BALANCE BOB. A counterweight for pump rods.

BALL HEAD. A steam stamp, so called because invented by a man named Ball.

BALL STAMP. A Ball head.

BARILLA DE COBRE. Spanish term for native copper, dressed, but unsmelted. Equivalent to the "mineral" of Lake Superior mines.

BARREL WORK. Copper in small masses, detached from its rock-matrices at the rock-house, and shipped in barrels direct to the smelter. Small masses, of a size to put in barrels.

BARROW. A wheelbarrow; also same as burrow.

BARTLETT. A Bartlett concentrating table.

BASALT. A trappean rock.

BASIC. A rock in which metals are combined with alkalies, such as potassium, sodium, etc.

BASIN. A synclinal; a trough in the earth's surface.

BATTERY. A set of gravity stamps, usually five in number, but sometimes less.

BEARING. The bearing of a mineral outcrop is its strike.

BEATING AWAY. To cut down or stope a mineral body.

BED. A stratified rock formation. Used in some mineral districts to mean veins or lodes lying horizontally, or approximately so.

BED-ROCK. The solid rock as differentiated from loose or surface rock. The ledge.

BELLS. Signals for lowering and hoisting the bucket, skip or cage in a shaft are usually given by bells, the number of strokes indicating the nature of the load, the place for landing, etc.

BIT. A steel drill. A short hollow cylinder of soft steel, used in diamond drilling. The diamonds are set around the inner and outer edges of the bottom of the bit and cut away the most refractory rocks when the bit is rotated.

BLACK COPPER. Copper partly smelted, but containing impurities requiring refining.

BLACK JACK. Zinc blende.

BLAST. To explode dynamite or black powder. Air forced into a furnace to aid in reducing the ore charge.

BLASTED. A miner that has been blasted is one who has been injured by the explosion of a charge of dynamite or gunpowder.

BLASTING. The breaking of rock by means of high explosives inserted in holes bored in the rock for the purpose.

BLENDE. Zinc blende.

BLIND DRIFT. A drift connected with the other workings of the mine at one end only. A cul de sac.

BLIND LODE. A lode that does not come to surface.

BLIND SHAFT. A shaft not coming to surface. A winze.

BLISTER COPPER. Copper of 96% to 99% pure.

BLOCKHOLE. A hole for explosives drilled in a mass of ore or rock already broken from the vein, but too large to handle.

BLOCKING OUT. To open the ore in a mine so that it can be won merely by stoping.

BLOSSOM. An outcrop of an ore body altered by weathering.

BLOWER. A fan used to force air into a mine.

BLOWING IN. A furnace or smelter is blown in when charged and the process of ore reduction begun by fire.

BOILING SHAFT. A sand-shaft in which quicksand and water boil up from the bottom.

BONNET. The cover or roof of a cage.

BORE HOLE. A drill hole bored for test purposes.

BORT. A form of crystallized carbon between the diamond and the black diamond.

BORTZ. Bort.

BOTTOMS. Impure copper formed below the matte, in matting copper ores.

BOULDERS. Detached masses of rock, rounded by attrition, usually found at or near the surface, in alluvial deposits lying above stratified rocks.

BOX CANON. A canyon closed at one end.

BRANCH. A vein branching off from the main ore body.

BRATTICE. A screen for the regulation of air currents in a mine opening.

BREAST. The face or working end of a drift, stope or adit.

BRECCIA. A conglomerate rock, in which angular fragments of rock are cemented together.

BRECCIATED. A rock stratum made up of sharply broken fragments, partially or wholly cemented together.

BROKEN. A vein is broken when lacking clearly defined walls or characteristics of regularity.

BROKEN GROUND. Rock strata where the walls are poorly defined and the general formation unsettled.

BROOD. Cornish for waste ore, such as mundic or zinc blende, where found in connection with copper ores.

BUCKET. A kibble. An iron or steel bucket used for hoisting in a mine. In a vertical shaft a bucket swings free in ascending and descending, but in an incline shaft the bucket runs on a skidway of plank or timbers, or else rides a trolley cable.

BUDDLE. A conical table on which ore is dressed. Machine and name both growing obsolete.

BULKHEAD. A wooden or masonry partition walling off a mine opening.

BULLION. Refined gold or silver before coining. Sometimes erroneously applied to copper.

BULLION BARS. Unrefined gold and silver secured by melting the precious metals precipitated to the bottom of the tank in the electrolytic refining of argentiferous and auriferous copper anodes.

BUNCH. A pocket exceptionally rich in mineral.

BUNCHY. An ore body given to considerable variations in width or values, or both.

BURDEN. Overburden.

BURROW. See rock burrow.

CABLE. The steel wire rope used in shafts for hoisting buckets, skips or cages.

CAGE. An elevator used in vertical shafts for hoisting mineral and for lowering men, timber, etc.

CAKES. Copper cast in cakes.

CALCAREOUS. Of a limey nature.

CALCINE. To drive off sulphur or other volatile constituents of an ore by heating.

CALCITE. Crystals of calcium carbonate.

CAM. A curved tooth, fixed on a shaft, for lifting the pistons of gravity stamps.

CAMP. A mining town.

CANON. (pronounced canyon). A deep gorge with precipitous walls.

CANYON. A canon.

CAP. The top piece of a framed set of mine timbers: copper caps containing fulminate of mercury, used to explode dynamite in blasting rock. The fuse is cut to proper length, one end placed in the cap, and the cap inserted in a pasty dynamite cartridge. The free end of the fuse is fired, and the explosion follows quickly or tardily, as the fuse is cut long or short.

CAPPING. The rock or other ground overlying the mineral body of a mine.

CAP-ROCK. Capping.

CAPTAIN. A man in charge of mining work is termed a captain. The mining captain is the executive officer underground.

CARBONACEOUS. Of a coal-like nature.

CARBONATE. An ore of any metal or metals with which carbon and oxygen are chemically united.

CARBONIFEROUS. Rocks of the geological ages usually associated with coal measures.

CARGA. A Mexican weight equalling 300 pounds avoirdupois.

CARTRIDGE. Dynamite put up in cylindrical cases of oiled paper to fit the holes bored by the drills.

CASING. The wooden lining of a shaft; an iron pipe put down outside of a diamond drill hole when passing through soft or broken ground, to prevent the hole becoming clogged by matter intruding from outside.

CASTING COPPER. Refined copper better suited for casting into various forms than for drawing into wires or rolling into sheets.

CAVE. A natural opening or "vug" in a rock formation; the partial or complete falling-in of a mine.

CAVING SYSTEM. A plan of mining, by which the worked out upper levels and surface are allowed to subside gradually as the mine workings are deepened.

CEMENT COPPER. The impure metal obtained from ores by leaching processes.

CERRO. Spanish for a hill showing rock outcrops.

CHAMBER. A large stope.

CHAPEAU DE FER. French for gossan or iron hat.

CHARGE. The amount of ore, flux and fuel required for one filling of a furnace.

CHIMNEY. An ore chute.

CHERT. A coarse flint containing calcium.

CHILEAN MILL. An arastra.

CHILE BARS. Bars of Chilean blister copper, weighing about 200 pounds each.

CHLORIDE. The ore of any metal or metals united chemically with chlorine.

CHURN DRILL. A drill having a churning motion, used for boring test-holes, or wells.

CHUTE. A section of a lode or vein differing by being much richer or leaner than the average.

CLACK. A pump valve.

CLAIM. Public land staked off and claimed by a prospector or miner. Size of claims varies in different countries.

CLAY COURSE. A seam of clay between vein and wall.

CLAY SLATE. An argillaceous slate.

CLEAN-UP. The cleaning up of accumulated ore or metal in a mill or smelter.

CLEAVAGE. The parting of rock along more or less regular lines of least resistance.

COARSE JIGS. The jigs used to handle the heavier grades of ore or metal.

COARSE METAL. Matte resulting from the first smelting.

COBBING. Breaking masses of ore into lumps by hand hammers.

COLLAR. The top of a shaft—the surface timbering of a shaft.

COMPANY ACCOUNT. Miners and other underground employes working on fixed wages per shift or month are usually called "company 'count men" to distinguish them from miners working on contract.

COMPARTMENT. Mining shafts are usually divided into two or more compartments, separated by framed timbers and planking.

CONCENTRATES. The concentrated ore or metal, after elimination of gangue rock.

CONCENTRATION. The process of separating native metal or ore from its gangue of worthless rock.

CONCENTRATING TABLES. Concentrators.

CONCENTRATOR. A plant where ores are concentrated; a jig. A machine for separating ore or metal from gangue-rock, the process usually employing a rocking or oscillating motion, aided by jets of water, whereby the worthless gangue is driven off and the heavier mineral retained by specific gravity.

CONDUCTIVITY. Electrical conductivity is measured by the resistance offered to the passage of an electrical current.

CONGLOMERATE. A pudding-stone rock formed by deposition of rock particles on old sea-beds, afterward covered by other rock strata.

CONSTRUCTION ACCOUNT. Many of the Lake Superior copper mines summarize their finances so that the cost of operation is divided into two classes, one being for general working expenses and the other for construction account. The latter includes new buildings and machinery on surface, and frequently new mine openings. In effect the construction account of a mine is like the stock account of a merchandise firm, and sometimes, like charity, "covers a multitude of sins."

CONTACT VEIN. A mineral body found between two unlike rock strata.

CONTOUR. The outline or configuration of any given tract.

CONTRACT. Many miners work on contract, agreeing to sink, drift or stope at a fixed price per running foot, or per fathom. These are known as contract-miners, and are usually the more skilled workmen.

COPPER ORE. See detailed descriptions of copper ores and copper-bearing minerals in chapter on chemistry and mineralogy.

CORE. A drill core.

CORNISH PUMP. A form of mine pump actuated by long rods reaching from surface down the shafts.

CORNISH STAMP. A gravity stamp, in which the heads are raised by cams and dropped by gravity.

COST BOOK SYSTEM. A plan of mine operation, used in Cornwall only, by which shares are subject to unlimited assessment. A sort of unlimited partnership.

COSTEANING. Developing. Proving an ore body by trenching across its outcrop at approximately a right angle.

COUNTERBALANCE. Hoisting plants are usually worked in counterbalance for deep shafts. The weight of the descending cage or skip is used to partially offset the weight of the cage or skip ascending.

COUNTER VEIN. A cross vein, running at approximately right angles to the main ore body.

COUNTRY ROCK. The predominant rock form of the district.

COURSE. The direction or strike of a mineral body.

CRAB. A hand winch.

CREEPING. The movement caused in mines by the pressure of superincumbent and adjacent rock masses.

CROPPINGS. Outcrops.

CROSS COURSE. An intersecting vein.

CROSSCUT. An opening similar to a drift, except that the crosscut is sent at approximately right angles to the formation, while a drift follows the trend of the lode or vein.

CRUCIBLE. A vessel of refractory material, used to contain ores and metals for assaying or smelting.

CRUSHER. A rock-crusher.

CRYSTALLIZED. Having plainly defined crystals.

CRYSTALS. Geometrical forms, with plane faces, of infinite variety, assumed by the majority of minerals.

CUPOLA. A furnace in a smelter.

CUPRIFEROUS. Copper-bearing.

CUTTING DOWN. When a shaft is enlarged, work begins at the top, and the work of enlargement is called cutting down.

CWT. A hundredweight, of 112 pounds avoirdupois.

DAM. A masonry barrier, built underground, to hold back water.

DATUM LEVEL. The level (usually sea-level or mean level of nearest considerable body of water) from which altitudes are measured in surveys.

DEAD ROASTING. Sulphide ores are dead roasted when all the sulphur possible to drive off by roasting has been eliminated.

DEAD WORK. The opening of new shafts, drifts and winzes, preliminary to the stoping of the mineral bodies.

DEBRIS. Broken down rock material.

DECOMPOSED. Rock or ore broken down by elemental action.

DECREPITATE. To break into fragments with violence, under the blow-pipe or great heat.

DENUDATION. The uncovering of rock strata by the weathering of wind or water, or both.

DEPOSIT. A term, loosely used, meaning a mineral body.

DERRICK. A mast, freely rotatable, carrying a boom or yard-arm, at the end of which is a sheave wheel. Used in mining mainly for open pit work.

DESSICATION. The drying out of water for any given substance.

DETRITUS. Debris. Broken down rock.

DEVELOPMENT WORK. Dead work.

DIAMOND DRILL. A machine for boring holes in rocks, taking its name from the black diamonds or bortz used to form cutting edges on the inner and outer edges of the hollow cylindrical bit.

DIE. The iron block in the mortar, on which the ore is fed for crushing under the stamp.

DIORITE. Greenstone. A crystalline spathic hornblende.

DIP. The angle at which a lode or vein descends from the earth's surface.

DIP COMPASS. A compass having the needle fixed to swing in a vertical plane.

DIRT. Frequently used to describe the ore broken underground.

DISSEMINATED ORE. Ore found scattered through a gangue of valueless rock.

DISTURBED. An ore body is disturbed when lacking defined walls and settled character.

DOLLY. A crude prospecting stamp, set on a spring pole.

DOLOMITE. Magnesian limestone; carbonate of calcium and magnesium.

DONKEY HOIST. A small auxiliary hoisting engine, usually operated underground and actuated by compressed air; or else used for preliminary work at new shafts or exploring pits.

DOWNCAST. A shaft having a downward air current.

DRAFTAGE. An arbitrary allowance claimed by English smelters to cover loss of weight in transport.

DRESSING. Separating ore from gangue rock by hand or machinery.

DRESSING FLOOR. A floor or dirt surface where ore is dressed by cobbing and other hand work.

DRIFT. A horizontal opening in a mine, following the direction of the lode or vein; loose alluvial matter, such as sand, pebbles and boulders.

DRIFT COPPER. Native copper found in alluvium far from its original rock matrice, whence carried by glaciers.

DRIFTING. Opening drifts. Driving.

DRILL. A steel bar for boring in rock, having a single sharp cutting face, or two cutting faces crossed at right angles.

DRILL-CORE. As the bit of a diamond drill is hollow, solid, cylindrical cores of rock are cut by its operation. These are raised to surface and form a valuable permanent record of the strata through which the drill has passed.

DRILL HOLE. A hole bored by a drill.

DRIVING. Drifting.

DROP SHAFT. A shaft, usually of heavy framing, sunk by weight, through sand or similar material.

DRUM. The cylinder of a hoisting engine, around which the cable winds:

DRUSE. A vug.

DUCTILE. That which is capable of being extended in length by tension.

DUCTILITY. The capacity of a metal to elongate, when under pull from the ends, without cracking or breaking.

DUMP. A place for dumping rock taken from a mine. An ore-dump contains good mineral, and a waste-dump the worthless rock hoisted from underground.

DYKE. A fissure in the rock formation, usually transverse, filled with igneous matter. When mineralized, dykes are called cross or counter veins.

DYNAMITE. Nitro-glycerine absorbed by wood pulp, infusorial earth, or some similar article to render it safer in use.

EISENER HUT. German for Iron Hat or Gossan.

ELECTRIC DRILL. A power drill operated by an electric current.

ELECTROLYTE. The solution in which electrolytic separation of metals is carried on.

ELECTROLYSIS. The separation and redeposition of metals by electrolytic action.

ELECTROLYTIC. Term applied to copper means copper gained from impure metal by electrical decomposition and redeposition, whereby the copper is taken from an impure bar and redeposited in a pure form at the opposite pole of the battery, while other metals are precipitated to the bottom of the tank in which this work is done.

ELVAN. Cornish name for the dyke rocks of Cornwall, usually greenstone or porphyry.

EROSION. The wearing away of surface masses of rock and soil by the elements and by glacial action.

ERUPTIVE. Rock matter supposed to have been deposited in molten form by volcanic action.

ESCARPMENT. A rock wall, nearly or quite vertical.

EXFOLIATION. The separation of thin leaf-like layers from the main body.

EXPLODERS. Fulminating caps.

FACE. The breast of a drift. A face of ore is the ore shown at the working end of a drift or stope.

FAHLBAND. A banded crystalline rock, carrying finely disseminated sulphide ores.

FALL OF GROUND. Rock falling from the roof into a mine opening.

FALSE SET. A temporary set of timber.

FAN. A device used to force air into a mine.

FATHOM. Six feet. In stoping, a fathom is a cube of six feet.

FAULT. Dislocation of a rock stratum by which continuity is lost.

FEE. The ownership of land in fee-simple.

FEE-OWNER. The owner of land in fee-simple.

FEEDER. A branch ore vein.

FERRUGINOUS. Carrying iron.

FILLING. Allowing a mine to fill with water. Occupying old stopes or chambers with waste rock.

FINES. The finer ores or metals saved in concentrating processes.

FINISHER JIGS. The jigs used to save the fine ores or metals in a concentrator or stampmill.

FIRE. The miner's warning cry when a blast is to be set off, is "fire."

FISSILE. That which may be easily split.

FISSURE. Rock matter foreign in nature to the walls on either side—evidently deposited at a later date geologically, in a crack in the original rock.

FISSURE VEIN. A fissure, containing ore, usually disseminated in a worthless gangue differing in nature from the country rock in which the fissure occurs.

FLAKE COPPER. Very fine scales of native copper.

FLEET-GEAR. A compensating device for taking up slack and paying out rope where a hoisting system is worked in counterbalance. Several turns of the cable are taken around each drum of the hoist, and the bight of the cable is carried to the rear and around a large sheave-wheel lying horizontally and traveling on trunnions, allowing the taking up or paying out of the cable.

FLOAT COPPER. Drift copper.

FLOOR. The floor of a drift or other horizontal mine opening; the underlying rock stratum.

FLOUR COPPER. Very fine native copper that floats on water and is very difficult to save in milling.

FLUCCAN. A seam of clay, found in ore bodies, or, more frequently, between the ore and walls of country rock.

FLUKAN. Fluccan.

FLUME. A launder or pipe line for carrying water.

FLUX. Any mineral or ore used in the furnace to aid in fusing the gangue rock and worthless elements, which combine with the flux to form slag.

FOLIATED. Having a laminated structure.

FOOT. The foot-wall.

FOOT-WALL. The foot. The stratum of rock underlying an inclined mineral lode or vein.

FORKING. Pumping water from a mine.

FORMATION. A term used to imply the general geological conditions of a given district.

FOSSICKING. Extracting metal or ore from old mines or waste burrows.

FRACTURE. A break.

FREE. A metal is free when virgin or native, and not combined chemically with any other element.

FREE-MILLING. A metal or ore that is readily separated from its accompanying rock by mechanical means.

FRIABLE. Easily crushed to a powder.

FURNACE. An oven for the smelting of ore.

FUSE. A cotton cord with a gunpowder core, so made as to carry fire to an explosive placed for use.

FUSIBLE. That which can be melted.

FUSION. Melting. Alloying metals while liquid, through heat.

GABBRO. A rock composed mainly of plagioclase feldspar.

GAD. A small wedge or chisel.

GALLERY. A drift.

GANGUE. The particles of foreign rock matter adhering to disseminated ores or native metal; the gangue rock is mechanically and not chemically united with the ore or metal.

GASH VEIN. A shallow fissure vein, usually wide at surface and rapidly narrowing to extinction.

GEODE. A hollow nodule of rock.

GEOLOGY. The science of the earth.

GIANT POWDER. Dynamite.

GLACIATION. The erosive effect produced by glaciers.

GLANCE. Any metallic sulphide showing a bright, shining surface.

G. M. B. "Good Merchantable Brands"—an English grade of refined copper.

GNEISS. A banded, slaty granite.

GOB. Mud above a mine. Refuse in worked-out openings.

GOPHERING. Prospecting work confined to digging shallow pits or starting adits. Term used from similarity of this work to the crooked little holes dug in the soil by gophers.

GOSSAN. Iron Hat. A rock capping, usually quartzose, showing reddish-brown iron stains, from decomposed iron pyrites. Frequently found overlying sulphide ores of copper.

GRADE. The percentage or value, when applied to ore bodies and partly refined metals.

GRANITE. A dense, granular rock, composed of varying aggregates of quartz, feldspar and mica.

GRANULATED. In the form of grains.

GRASS ROOTS. At surface.

GRAVITY STAMP. A stamp, usually set in batteries of five, in which the piston is raised by a cam, the stamp crushing the charge in the mortar by its weight when allowed to fall.

GREENSTONE. Diorite, or gabbro.

GRIZZLY. A grating of heavy iron or steel bars, through which the smaller pieces of rock or ore fall.

GROSS TON. A long ton of 2,240 pounds avoirdupois.

GROUNDSILL.[*] The bed-piece of a set of mine timbers.

GUIDES. Perpendicular wooden stringers for guiding cages in vertical shafts.

GUT. To rob.

HADE. (American). Dip of a vein from the zenith. (English). Dip of a vein from the horizon. Take your choice.

HALVAN. Cornish for refuse copper ore.

HANGING. The hanging-wall; the stratum of rock overlying an inclined mineral lode or vein.

HARDHEAD. A lump of partly smelted ore, carrying high percentages of refractory elements, such as iron, antimony and arsenic.

HAT. The capping of a mineral body.

HAULAGE PLANT. A mechanical installation for the underground tramming of rock, operated by ropes, compressed air or electricity.

HEAD. Water pressure.

HEADGEAR. A building, or framework, fitted with sheaves, over the mouth of a shaft.

HEAP-ROASTING. Burning the sulphur out of ores piled in heaps with a small amount of wood or other fuel.

HEAVE. A fault. The rolling out of line of dip by a lode in making depth.

HEAVING. Rolling.

HECTARE. A metric measure equalling 2.471 acres.

HOIST. An engine for hoisting, the rope, as raised, being coiled around a drum.

HOISTER. A hoist.

HOLE. Any opening in the ground. More especially a hole drilled for explosives.

HOLING THROUGH. A drift or other mine opening is holed through when a connection is made between two separate ends working toward each other.

HORIZON. The sky-line, commonly used in the sense of absolutely flat, as shown by a spirit level. Geologically, all rock strata of the same geological period.

HORSE. An intrusion of country rock into a mineral body. Sometimes synonymous with dyke.

HORSE-WHIM. A windlass operated by horse-power.

HUEL. Cornish for mine. Commonly spelled wheal.

HUNGRY. Nearly or quite barren of mineral value.

HUNTINGTON MILL. An improved Chilean mill.

HYDRATED. Containing water of crystallization.

HYDRO-METALLURGY. The reduction of ores by wet processes.

HYDROUS. Containing water.

IGNEOUS. Rocks of volcanic origin.

IMPREGNATED. Containing ore. Properly used in referring to country rock carrying mineral similar to that in the vein.

IN PLACE. Rock matter in the position where deposited by nature.

IN SITU. In place.

INCH. See Miner's Inch.

INCLINATION. The dip of a vein from the horizon measured in degrees.

INCLINE SHAFT. A shaft sunk at any angle with the horizon under 90°.

INCRUSTATION. A solidified coating, usually crystallized.

INFILTRATION. The deposition of mineral matter from percolating water.

INGOT. A mass of metal cast in a peculiarly formed mold; applied only to gold, silver or copper. Iron is cast in pigs.

INTAKE. The opening for water to enter a pipe or flume.

IRIDESCENT. Showing the colors of the rainbow.

IRON HAT. Gossan.

JIG. A machine for concentrating ore or mineral by means of oscillatory or vibratory motion, aided by jets of water, separation of the ore from its gangue being effected by the greater specific gravity of the former.

JIGGER. A crude jig.

JIGGING. Concentrating ore by the use of a jig.

JUMPER. A churn drill.

JUNCTION. The uniting point.

KEWEENAWAN. Pertaining to or of the Keweenaw formation, in which the Lake Superior copper mines are opened.

KIBBLE. A bucket used for hoisting material in a shaft.

KILLAS. Clay slate or shale.

KILOGRAM. A metric weight of 2.2046 pounds.

KILOMETER. A measure of distance equalling 0.621376 miles.

KINDLY. Appearance of rock carrying or promising to carry good mineral values.

LADDER ROAD. A ladderway.

LADDERWAY. The series of ladders giving ingress and egress to a mine shaft; the compartment in which the ladders are.

LAGGING. Timber, usually of small diameter, placed over the cap-timbers of incline shafts and drifts, to prevent damage from falling rock.

LAMINAE. Thin plates.

LANDER. The man at the mouth of the shaft, who receives signals from below, and attends to the unloading of rock sent up in buckets, skips or cages.

LAUNDER. A wooden flume or sluice, used to convey water, or tailings held in solution in water.

LAVA. Rock formed by flows from volcanoes.

LEACH. To dissolve minerals from ore by water.

LEACHING. Lixiviating ores.

LEAD (leed). A mineral body.

LEDGE. The solid rock where encountered at or nearest surface.

LEG-PIECE. An upright timber supporting the cap of a timber set.

LEGS. The side pieces of a set of timber.

LENSE. An ore body of lenticular form.

LENTICULAR. Having the shape of a double convex lense.

LEVEL. A horizontal opening in a mine. Levels are commonly opened at stated intervals as depth is gained—usually at 100 feet in modern mining practice. The word "level" is frequently used interchangeably with the word drift, but is more comprehensive. Both drifts and crosscuts may be opened on a level, but a crosscut is not a level.

LIGNEOUS. Of a woody nature.

LIMESTONE. Calcium carbonate.

LIXIVIATION. The process of leaching out mineral values from ores.

LODE. A stratified rock bed carrying mineral values.

LONG TON. A gross ton of 2,240 pounds avordupois.

MAGMA. Gangue. Rock material carrying ores.

MALLEABLE. Capable of changing form, without breaking, under a hammer.

MAN-CAR. A skip-truck having tiers of circus seats, used for carrying miners to and from work in mines operating inclined shafts.

MAN-ENGINE. An appliance for raising and lowering miners in deep incline shafts. Consists essentially of two long beams, worked in counterbalance and having platforms at stated intervals.

MASS. A solid chunk of native metal.

MASSIVE. Rock without defined lines of cleavage.

MATRICE. The rock surrounding an imbedded object, such as a nugget or mass of native copper.

MATRIX. Matrice.

MATTE. Regulus. A product between copper ore and blister copper, varying greatly in the percentage of metal contained. Is obtained by roasting out more or less sulphur from sulphide copper ores.

MATTING. The process of converting sulphide ores into matte.

MESA. Spanish for a tableland or plateau.

MESH. The size of openings in a screen.

METALLIFEROUS. Carrying metal.

METALLURGY. Science and practice of reducing metals from ores and minerals.

METAMORPHIC. When said of minerals refers to a rock that has undergone structural and chemical changes after its original formation.

METRE. A linear measure equalling 39.37 inches.

METRIC TON. A weight of 2204.6 pounds avordupois.

MILLING. Dressing ore in a mill; also running ore in a mine through a winze for loading into tram-cars or wheelbarrows on a lower level than the one where broken.

MILL RUN. A test of the mineral contents of rock or ore by actual milling.

MINE. An open pit, or underground opening or openings from which mineral values are extracted.

MINER. In strict construction, the man that does the drilling and blasting in a mine. In a broader sense, all men working underground.

MINERAL. Ore, or rock containing metal. In the Lake Superior district the term mineral has a special use, being employed to designate the native copper, with its adhering gangue of amygdaloid or conglomerate rock, as it comes from the mill, before sending to the smelter.

MINERAL BELT. The mineralized territory in a given formation or district.

MINERAL DE COBRE. Copper matte.

MINERALOGY. The science of minerals.

MINERAL RIGHTS. The ownership of the rights to mine under the surface of land. Mineral rights are sometimes reserved in selling the surface of land, in some districts.

MINER'S INCH. The amount of water that will flow through an opening one inch square under a six-inch head, which is 2,274 cubic feet in 24 hours, or 94¾ cubic feet per hour, equal to 665 wine gallons, or 593 imperial gallons hourly.

MISSED HOLE. A drill hole, charged with explosives which fail to be set off by the fulminating cap.

MOIL. A steel bar, like a drill, except that it is sharpened to a point instead of having a cutting face.

MOLDS. Copper cast in molds.

MORAINE. A mass of boulders and detrital material marking the limits of a former glacier.

MORTAR. An assayer's mortar in which rock or ore is crushed with a pestle; a mortar box.

MORTAR BOX. The iron box under the stamps, into which ore or rock is fed for crushing.

MUCKER. A trammer.

MUNDIC. Pyrite; sulphide of iron.

NATIVE. A virgin metal—not an ore.

NON-CONFORMABLE. Rock strata evidently not originally associated in the position now occupied.

NUGGET. A lump of native metal. Term usually applied to gold.

OPEN-CAST. Working a mine as a quarry, without underground openings.

OPEN CUT. A mine worked open-cast.

ORE. A chemical union of one or more metallic elements with other elements, usually non-metallic, of which oxygen, carbon and sulphur are the most frequent. For the various ores of copper, see chapter on chemistry and mineralogy.

ORE CAR. A mine car for carrying ore or waste rock.

ORE DUMP. See Dump.

ORTHOCLOSE. Silicate of potassium and aluminum. An acid feldspar.

OUTCROP. The ledge of a lode or vein that is exposed on the surface of the earth.

OUTLIER. An isolated rock or group of rocks lying at a distance from the main body, and separated therefrom, on the surface of the earth, by a different rock formation.

OUTPUT. Production.

OVERBURDEN. Superincumbent material, usually drift or alluvium.

OVERHAND STOPING. Removing ore in ascending steps.

OXIDATION. Process of conversion of metals or ores into oxides by weathering.

OXIDE. An ore of any metal or metals chemically united with oxygen.

OXIDIZED. United with oxygen. Many minerals and most metals oxidize with greater or less rapidity when exposed to air or water.

PARE. Cornish for a gang or shift of miners.

PARTING. The separation of two or more metals mechanically admixed, by electrolysis, cupellation, use of acids or other chemical or metallurgical processes.

PASS. A winze.

PATENTED. A mining claim is patented when the government executes a deed or patent to the holder.

PENTHOUSE. A shed-roof erected in the bottom of a shaft, when sinking, to protect miners from accidental fall of rock, timber or tools from above.

PENTICE. An erroneous spelling of penthouse.

PEROXIDE. The oxide of any metal containing the greatest proportion of oxygen.

PERPENDICULAR SHAFT. A shaft sunk vertically.

PERTENENCIA. One mineral claim in Mexico; area, one hectare, or 2,471 acres.

PETERING. Pinching.

PETER OUT. To pinch out.

PETROGRAPHY. The science of rocks.

PHOSPHATE. An ore of any metal or metals with which phosphorous and oxygen are chemically united.

PICK. A pick ax.

PICUL. A Chinese weight of 133⅓ pounds.

PILLAR. A section of rock or ore left in place to support shafts or roofs.

PINCHING. The narrowing of a vein.

PINCHING OUT. The narrowing of a vein to extinction.

PIT. An opening in the earth's surface, usually shallow.

PITCH. Synonymous with "dip," but occasionally used to designate the angle of decline from the horizon measured along the strike of the lode or vein.

PITCHING. The irregular descent of a vein.

PLAIN. A flat, champaign country.

PLANT. The machinery equipment of a mine or reduction works. In general use the term includes buildings housing machinery.

PLAT. The enlargement of a shaft at a level, to give extra space for loading and unloading the cage, skip or bucket.

PLATEAU. A flat table land, similar to a prairie, but at a higher elevation.

PLUTONIAN. Volcanic.

PLUTONIC. Rock strata of volcanic origin overlaid at some time by later beds.

POCKET. Underground, an ore deposit, usually of small extent. On surface, a bin at shaft house or mill, in which ore is stored.

POCKETY. Where a mineral body carries values very irregularly, in spots, it is said to be pockety.

POLL-PICK. A tool having a pick on one end, and a poll, or hammer head, on the other.

POOD. A Russian weight of 36.112 pounds avordupois.

POPPET-HEAD. Framework over a shaft for a sheave-wheel.

POWER-DRILL. A machine for drilling holes in rock, actuated by compressed air, steam or electricity.

PRILL. Cornish for selected ore secured by cobbing.

PRIMARY. The oldest rock formations.

PROP. A heavy timber placed with its foot against the floor of a mine opening and its top against the roof, to support the rock above.

PROSPECT. To seek for mineral: a new mining property that has not yet earned the right to be called a mine.

PROSPECTING. Exploratory work for mineral, on property where no regular mine has been opened.

PROSPECTOR. A searcher for mineral.

PROTOXIDE. The oxide of any metal containing the least proportion of oxygen.

PUDDINGSTONE. A coarse conglomerate showing rounded pebbles.

PULLEY-STAND. A temporary tripod or other light frame construction, holding a pulley, over which the rope used in hoisting is passed.

PULP. Wet, concentrated ores.

PULVERIZE. To crush to a powder.

PYRRHOTITE. Magnetic iron sulphide.

PYRITE. Iron disulphide.

PYRITES. Sulphide ores; pyrite.

PYROGNOSTICS. Characteristics of a mineral under the blowpipe.

QUARRY. An open pit, of varying size, sometimes several acres in area, from which stone or ore is mined.

QUARTER-SECTION. A quarter of a square mile of land; 160 acres laid out in a parallelogram, each side of which is one half mile in length.

QUARTZ. Silica. Dioxide of silicon, frequently containing traces of iron and other minerals, and often the gangue of gold and other metals.

QUARTZITE. An oxide of silicon, with other minerals in varying quantities, partly granular and partly crystalline in structure.

QUARTZOSE. Rock having much quartz in its composition.

RAGGING. Cornish for rough cobbing; middle sized broken lumps of ore.

RAISE. A shaft or winze that is being opened from below. Sometimes called upraise or uprise.

RANGE. A mineral belt, also in many American states a surveyor's term for describing and locating lands. The state is surveyed in sections (with their subdivisions), towns and ranges. A town (or township) comprises 36 sections and is a square of six miles. Each township receives a double number, one for the town and one for the range. The towns are numbered consecutively from south to north and the ranges are similarly numbered from east to west.

RAW ORE. Ore before treatment.

REAMER. A tool like a bit, used to enlarge a hole previously drilled.

REDUCTION. The separation of metals from their ores.

REEF. A stratified mineral-bearing rock formation.

REFINING. The elimination of impurities from crude metals, or separation of metallic alloys obtained in the reduction of ores.

REFRACTORY. A refractory ore is one that cannot be smelted by ordinary metallurgical processes. A refractory stamp-rock is one that is pulverized with unusual difficulty.

REGULUS. Copper matte.

RESERVES. Bodies of mineral-bearing ground opened in a mine ahead of immediate requirements.

REVERBERATORY FURNACE. A smelting furnace in which the flame from the grate is reflected back on the charge of ore by the roof.

RISE. A raise.

ROASTING. Driving off sulphur and other similar volatile elements from ore by heating. When done in a furnace under great heat, the process is called calcining.

ROASTING FURNACE. An oven for the expulsion of sulphur, arsenic and other volatile elements from ore.

ROB. A mine is robbed when its pillars and other supports are removed for their mineral values, regardless of the future of the property. Done only by unprincipled persons or when the mine is about to be abandoned.

ROCK. Stone.

ROCK BURROW. A pile of refuse rock from a mine.

ROCK CAR. An ore car.

ROCK-CRUSHER. A machine for reducing rock or ore to smaller sizes. Crushers are of two types, the jaw-crusher and the centrifugal. The jaw-crusher works as a man cracks nuts with his teeth, the centrifugal operates on the plan of a coffee-grinder.

ROCK-DUMP. The place where worthless rock is piled.

ROCK-FILLING. Waste rock placed in worked-out stopes as a support for the roof.

ROCK-HOUSE. A building where copper-bearing rock is received and put through crushers before shipment to the mill. Is really a preparatory mill. Is usually built in connection with a shaft house.

ROLLING. In its descent, a lode or vein, while fairly constant to a given angle on the average, frequently makes depth at irregular angles. This is called rolling.

ROLLS. Heavy steel rollers, worked in pairs like a clothes-wringer, used for crushing rock and ore.

ROOF. The rock above a mine opening.

ROOM. Similar to a stope; term usually applied to mines working mineral bodies lying nearly horizontally.

ROYALTY. A percentage paid to the fee-owner from mineral values obtained by the lessee of a mine.

RULE-OF-THUMB. The guess-work and rough measurement plan of mining, in contradistinction to systematic development from data obtained by careful surveying and engineering.

RUN. When superincumbent material is coming into mine openings, the ground is said to be running.

SADDLE. An anticlinal.

SAFETY CAGE. A cage furnished with automatic appliances to stop its descent in case the cable breaks. Usually works well in theory.

SALT. A chemical union of an acid with a base.

SALTING. Placing foreign ore in a mine to deceive intending purchasers or other interested parties.

SAMPLE. A specimen of ore—usually not the worst to be found in the mine.

SAND PUMP. A pump, usually centrifugal, designed to lift water carrying large quantities of coarse tailings.

SANDS. Tailings from the stamp mills of Lake Superior copper mines.

SAND SHAFT. A shaft sunk through sand.

SAND WHEEL. A large wheel, having buckets on its inner perimeter, for elevating water carrying stamp sand.

SCALE COPPER. Copper in very thin flakes.

SCHIST. A metamorphic slaty rock of foliated structure.

SCHISTOSE. Approximating to schist.

SCORIA. The slaty, porous portion of a lava flow; slags from copper smelters.

SCRAM. A mine that is being gone through carefully, when apparently worked out, for mineral previously overlooked; to scram.

SCRAMMING. Searching a mine for mineral previously overlooked.

SCREEN. A grating of perforated metal or woven wire.

SEAM. A thin layer of rock or ore.

SECONDARY. Rock strata of the second period.

SECTILE. That which may be cut easily.

SECTION. A field or district; also, in the United States of America, a square mile of land.

SECTION POST. A boundary mark set at section corners by surveyors.

SEDIMENTARY. Rocks formed by deposition from water, as contradistinguished from rocks formed by igneous action.

SELVEGE. Fluccan.

SET. A framed set of timber used for supporting ground in a mine.

SHAFT. A downward opening into a mine, with its upper end at surface.

SHAFT-HOUSE. A building at the mouth of a shaft, where ore or rock is landed from below.

SHALE. An argillaceous slate, of fissile structure.

SHEAVE. A grooved wheel, notched to carry rope. An open pulley.

SHIFT. A miner's turn, of eight to ten hours' work; a force of men employed on one turn.

SHIFT-BOSS. A mine boss or under captain in charge of one gang or party of miners.

SHOE. A stampshoe.

SHOOT. A chute.

SULPHOANTIMONIDE. An ore of any metal or metals with which sulphur and antimony are chemically united.

SULPHOARSENIDE. An ore of any metal or metals with which sulphur and arsenic are chemically united.

SULPHURET. A sulphide. Term becoming obsolete.

SUMP. The bottom of a shaft, where water collects.

SURFACE CAPTAIN. A mine superintendent whose duties are wholly on surface.

SURFACE RIGHTS. The ownership of the surface of land only, where mineral rights are reserved.

SWABSTICK. A stick used to clean out drill-holes.

SYNCLINAL. A trough formed by rock strata that are low in the center and high on the sides. Reverse of an anticlinal.

TABLE. An ore concentrator, of which there are various forms.

TAILINGS. Refuse matter from a stamp mill.

TAMPING. Closely packing clay or other sticky earth into a drill-hole above the cartridges, to give greater force to the blast.

TAPER OFF. Cornish for stopping work temporarily.

TELERA. Spanish for a roast-heap of sulphide ore.

TENSILE STRENGTH. The resistance to breaking or elongation offered by metal when under strain from either end.

TERRERO. Spanish for waste burrows.

TERTIARY. Rocks of comparatively recent formation, as time is measured by geological periods.

TEST-PIT. A shallow pit sunk to discover mineral.

THROW. The vertical displacement of a vein caused by faulting.

TIMBER. The wooden beams and sticks used for underground supports.

TIMBER-BOSS. The head timberman.

TIMBERMAN. One who works at timbering a mine.

TON. See Metric, Long and Short tons.

TONELADA. Spanish for ton.

TOSSING. Jigging finely comminuted ore.

TOWN. See Range for description.

TRACHYTE. A micaceous hornblende and feldspar rock.

TRAM. To load rock or ore in tram-cars and push same to the shaft; a tramway.

TRAM-CAR. A car running underground on light T-rails, used for carrying rock from the stopes and other workings to the shafts.

TRAMMERS. Men who load and tram the broken rock underground.

TRAP. A dense gray, blue or greenish rock of volcanic origin; of considerable variety in different beds, but usually of feldspathic-augitic nature.

TRAPPEAN. Pertaining to trap rock.

TREND. The general direction of a mineral body.

TRESTLE. A frame-work of timbers, connecting various mine and mill buildings on surface, usually carrying tram-tracks.

TRIBUTE. The royalty or percentage paid by workmen to owners for the privilege of working a mine. Apt to be a form of grand larceny, at the expense of the mine's future.

TRIBUTOR. One who works a mine on tribute.

TRIPOD. The three-legged iron frame on which the working parts of a power-drill rest.

TROLLEY-CABLE. A wire rope sometimes used in an incline shaft as a guide for the bucket.

TROUBLED. A vein is troubled when disturbed or faulted.

TSUBO. Japanese measure of six feet square, equalling 36 square feet.

TUFA. (Calcareous). A porous limestone;(volcanic). Loosely cemented ash and scoria from a volcano.

TURBINE. The most efficient form of water-wheel.

TUTWORK. Development work.

UNCONFORMABLE. Rock strata that do not correspond as to bedding, horizons or geological age.

UNDERHAND STOPING. Removing ore in descending steps.

UNDERLAY. The mineral bodies lying under a given tract, though not outcropping on surface.

UNPATENTED. Mining claims held from the United States Government subject to annual assessment work.

UNSTRATIFIED. Rock forms not bedded in layers.

UNWATER. To free from water; to pump out.

UPCAST. A shaft having an upward air current.

UPRAISE. A raise.

VAN. To dress ore.

VANNER. A jig for dressing ore by means of vibratory motion, aided by jets of water to carry away gangue-rock.

VARA. A Spanish-American measure of 33 inches.

VEIN. A mineral body having defined walls. See contact vein and fissure vein.

VEINSTUFF. Ore with its associated gangue.

VENTILATION. The system of natural or artificial air currents in a mine. See air-shaft.

VERTICAL. Perpendicular. Upright and downright.

VERTICAL SHAFT. One sunk at an angle of 90° with the horizon, or directly downwards toward the center of the earth.

VINNEY. Cornish for copper ore with a green coating caused by weathering.

VIRGIN. Native metal, as distinguished from ores, which are chemical compounds.

VITREOUS. Of a glassy nature.

VOLATILE. That which can be driven off as vapor, by heat.

VUG. A druse. A hollow, or cave, entirely surrounded by rock. Usually shows fine crystallizations.

WALL. Rock of a different formation adjoining a vein or other ore body.

WATER DRILL. A power drill in which a current of water runs through the bit of the drill, changing the rock dust from the bit into sludge which is expelled from the bore-hole by the force of the current.

WATER JACKETED FURNACE. A smelting furnace provided with an outer jacket, between which and the furnace proper water is circulated.

WATER LEVEL. The point above which water does not rise when a mine is allowed to fill.

WEATHERED. Rock altered in structure by exposure to air and water.

WET PROCESSES. Leaching processes; lixiviation.

WHEAL. Cornish for mine. Synonymous with bal.

WHIM. A windlass with a horizontal drum.

WHIP. A rope and fixed pulley or pulleys, for hoisting.

WILFLEY. A Wilfley concentrating table.

WINCH. A windlass.

WINDLASS. A winding device for hoisting from a pit or shaft, by means of coiling a rope or cable around a drum.

WIRE BARS. Refined copper cast into bars for wire drawing.

WORKINGS. The underground openings of a mine.

YELLOW COPPER ORE. Chalcopyrite.

ZINC BLENDE. Sphalerite. Sulphide of zinc.

CHAPTER VII.

Copper Deposits of the United States.

In this chapter will be found synopses of the principal features of interest, scientifically and commercially, of the copper deposits of the United States, arranged by states and territories, in alphabetical order.

ALABAMA. This state possesses deposits of chalcopyrite ore occurring as veins in igneous rocks, in Cleburne and Randolph counties. The upper portions of at least two of these veins carried good values in oxide and carbonate ores, with some associated gold and silver values, and occasional sheets of native copper. Two mines were worked quite extensively in the seventies. These were closed when the altered ores were replaced at depth by sulphides. There has recently been some revival of interest in Alabama copper ores, which, so far as known, are confined to the northwestern corner of the state, and some development work is now under way.

ALASKA. In giving consideration to the mineral deposits of Alaska, it must be borne in mind that this territory is an empire in itself, having a greater area than France and Germany combined. The copper deposits, known and partially prospected, are scattered over a vast territory, and occur under such varying geological and geographical conditions that comments pertinent to one district might be entirely inapplicable to another. Alaskan copper deposits cannot be considered as one district, but as a number of separate fields, with all the distinctions implied thereby.

It may be said, in a general way, that there is much copper in Alaska. It may also be said that there are many and able liars in Alaska. There is little question that the various placer gold camps of interior Alaska and the Yukon have been systematically boomed by an organized claque, to the benefit of sundry transportation lines and outfitting firms. Many of the press despatches have been of a misleading nature, and there are evidences that similar systematic promotion of a copper mining boom is being attempted. This is not intended to apply to the local newspapers of Alaska, but to certain not always veracious correspondents, and to various newspapers along the Pacific coast. This criticism will doubtless bring forth warm expostulations, and perhaps the author will be accused of attempting to deliberately injure a new and promising copper field, though such is not the case. There is every likelihood that good copper mines will be opened in Alaska. In fact, several now opening are of more than ordinary promise, but there has been so much of exaggeration, of misrepresentation and of downright lying, about Alaskan copper deposits, that the reported finds of mountains of pure copper must be taken *cum grano salis.* The bogus mine promoter always finds his most profitable field in a district far from centers of population and difficult of access. Ten years ago Arizona was filled with wildcat mines and mining fakers of all grades, and they gave that territory a very bad reputation among investors. This bad state of affairs has been greatly ameliorated of late, and while there are still salted mines and mine salters in Arizona, the standard of mining and mine promotion has been greatly raised in the past few years, as the district has become more accessible and better known. Alaska is today where Arizona was ten years ago—a *terra incognita*, where all things are possible, and a country of such magnificent distances that the natural-born liar finds opportunities of outdoing his own best records. There are fine copper mines awaiting opening in Alaska, but there are also cleverly made bogus gold bricks awaiting purchasers. The country undoubtedly offers great opportunities to investors with the capital, skill and business sense required for successful mining in any part of the world, but common business prudence dictates careful examination by competent experts before the investment of money. All legitimate mining districts court this sort of investigation.

Copper is reported as occurring at many points in Alaska, prominent among which are the valleys of the Copper, White, Chitna and Tanana rivers; on Latouche and Prince of Wales islands, along the Mt. St. Elias range; at various inland points in the Ketchikan district; on the Scolai range; at Sunrise, and elsewhere. Alaska is a hilly and often mountainous country, except along the tundra of the Arctic circle, and the valleys of the large rivers, often five to thirty miles in width, are the natural highways for prospectors, hence it arises that mineral discoveries are first reported from them, in the interior districts.

The copper fields of the Copper river and its principal tributaries have attracted the widest attention, though the most important developments are along the coast. The Copper river basin, with the valleys of its tributary rivers, is a vast field, and will require many years for even a fairly complete preliminary examination. This basin is a broad synclinorium, the central part of which is occupied by the Wrangell Mountains, which are of Tertiary age. Copper ores are reported from many points along the valley of the Chitna and between that river and Mt. Wrangell.

The White river is a tributary of the Yukon, with a generally northerly trend. Kletsan creek, a small tributary of the upper White, has excited much interest, because of the occurrence of native copper, which has been gathered and used by the natives for arrow-heads, bullets and ornaments. Scolai Pass is the divide between the head waters of the White and Chitna rivers. Mr. James Lindsay, a well-known consulting engineer of Portland, Ore., spent the spring and summer of 1902 in Alaska, and made a very careful examination of the upper White river copper fields. He informs me that the much-talked-of Kletsan creek is apparently of little importance as a possible future source of copper supply. The native copper occurs in placer form only, and has evidently been derived from ancient basaltic dikes intersecting greenstone diorite and carboniferous limestone. The river valley for a hundred miles east from Scolai Pass is covered with volcanic ash, which is over 100 feet deep at the international boundary line on the White river. This volcanic ash meets the perpetual snow and ice at an altitude of 6,000 feet on the mountains, and the cupriferous veins are most effectually hidden by the scoria or by the everlasting ice and snow, affording about as discouraging a prospect for exploration as could be found at any point on the globe. The United States Geological Survey reports that the largest placer nuggets of copper in the Kletsan creek valley weigh eight to ten pounds, and that investigation disclosed the original home of the placer copper to be in the greenstones, which were traversed by irregular joints, in which calcite was deposited, and these were found to carry copper, the veins so found being small and of no commercial value. All of the cupriferous veins were in contact with the limestone. In the same neighborhood are trappean amygdaloids carrying amygdules of chalcopyrite.

Discoveries of native copper, bornite and chalcopyrite are reported from the Kotsina river. Near the Kuskulana river a mass of native copper, three feet wide and eight feet long, was found.

On the islands and mainland in the Prince William's Sound district a number of promising properties have been opened, one of the most advanced being on Latouche Island. The Alaska Central railroad is to run from Valdez, at the head of Resurrection Bay, on Prince William's Sound, to Rampart, on the Yukon river, near the Arctic circle and international boundary line. Preliminary surveys have been made and while the exact route of the line is not fully determined at all points, the road will run along the valley of the Copper river from Copper Center to Mentasta Pass, thence northwesterly, crossing the upper Tanana to the Yukon, a distance of approximately 400 miles. This railroad will traverse several promising mineral districts, and its construction seems assured.

At the present time the most important copper district of Alaska is in the vicinity of Ketchikan, in southern Alaska. On Prince of Wales Island several mines are being opened on veins of sulphide ore that are apparently of good width and permanence, and which carry gold and silver as well as fair percentages of copper. This district has the advantage of tide-water, giving cheap and fairly rapid communication with the cities of Puget Sound and the Pacific coast of the United States. It is quite certain that the first regularly producing copper mines of Alaska will be developed here, and some of them should become factors in the world's production during the present year.

ARIZONA. Arizona is the third district of the United States and the fourth in the world in point of productive capacity. No other copper field has shown such marked gains in production during the past decade, and there is every reason to believe that the output will continue to increase for many years to come.

Arizona has nearly a quarter of the copper mines of the United States. Many of them are of very doubtful value; a few are of fully demonstrated worth, and a considerable number give promise of becoming both

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large and profitable producers. The mere fact that a copper mine is located in Arizona should not prejudice opinion for or against it. Some of the best and some of the worst mines ever opened are in this territory, and each mine should be judged individually, upon its merits.

There are evidences of rude mining by prehistoric peoples at a number of points in the territory, but no traces of smelting, and had the copper ores been reduced, the slags, and possibly remnants of the furnaces, could hardly have escaped attention in modern days. It seems likely that the iron ochres, malachite and azurite were mined in a crude way, for pigments. Prehistoric turquoise mines have been found at several points, notably in the Dragoon Mountain range.

The first copper made in Arizona was turned out of an adobe furnace at the Longfellow mine, Clifton, in 1873. The nearest railroad point was 800 miles distant at that time. The development of the mineral resources of the territory of Arizona has been a remarkable one, during the three decades that have since elapsed.

The copper zone of Arizona, broadly speaking, has a general southeasterly and northwesterly trend, and the copper deposits, as a rule, are found along the contacts of igneous rocks, such as porphyry and diorite, with limestone of the Paleozoic group, mostly of the carboniferous series. The general geological conditions of Arizona are much the same as in the adjoining Mexican state of Sonora.

Copper ores are found in more or less profusion in every county of the territory. The counties are of princely size, and as the topography ranges from hilly to mountainous in most parts, not even the best known districts have been developed yet, or even fully prospected. Nearly all of the ores of copper are found in Arizona, and native copper is of not uncommon occurrence, especially in the mines at Clifton and Bisbee. The principal copper districts are four in number, as follows: Bisbee, in Cochise county, only six miles from the Mexican border; Jerome, Yavapai county, in the northwestern part of the state; Clifton, including Morenci, in Graham county, north of Bisbee and close to the New Mexican border; Globe, Pinal county, not far from the center of the territory. In addition to these four principal districts, all of which are considerable producers, in about the order given, there are a dozen or more smaller districts, such as the Helvetia, in Pima county; the Wickenburg, and others.

The Bisbee district, of which the town of that name is the center, is really a part, geographically, of the great Sonoran copper belt of Mexico. The ore deposits occur in carboniferous limestones, bedded in nearly horizontal planes, and underlaid by quartzite. The veins are notable for the quantity of fluccan along the walls, and are easily mined as a rule. The clay carries considerable finely comminuted native copper and masses of native metal of respectable size are occasionally encountered. The oxidized zone extends to a depth of perhaps 400 feet and is succeeded by unaltered iron-copper sulphides that average excellent values. The oxidized zone is notable for the richness and extent of its high-grade carbonate ores.

The country rock of the Jerome district is slate, extensively intruded by dioritic igneous rocks, slates and diorites having a capping of uncomformable limestones of later age and devoid of copper. There is a limited zone of oxidized ores, but the principal dependence is placed upon the unaltered disseminated sulphides. These are by no means remarkable for their high percentages of copper, but are notable for their great extent and the high values carried in gold and silver.

The Clifton district has quartzite and limestones superimposed on granite, with intrusive igneous rocks of both basic and acid types, the entire formation being greatly faulted. Ore occurs in both the eruptive rocks and the limestones. It was in this district that the first Arizona copper mining was done, three decades ago. There were very extensive deposits of rich oxidized ores near the surface, along the contacts between the porphyry and magnesian limestone. These ores were self-fluxing and highly profitable but gave out at shallow depth, and, contrary to the usual rule, were not succeeded by sulphides. Extensive openings, on the porphyry of Humboldt Mountain, have developed enormous beds of low-grade sulphides, during the past ten years, and these are now the mainstay of the district, though some carbonate ores are still mined. The leaching process, little used in the United States, is employed to advantage in the treatment of certain of the low-grade ores of this district.

The first mining in the Globe district was done in 1876, and was for silver. The Old Dominion, the principal producer and a typical mine of this field, is opened on a contact vein between a diorite foot and a hanging of carboniferous limestone, over the greater part of which there is a trachyte capping. The principal ore bodies are in the limestone, and the ores are mostly oxidized. A peculiar feature is the presence of a sulphide zone which has oxidized ores both above and below. The ores are highly silicious and require heavy fluxing with iron and lime. The lack of sulphide ores, to furnish the iron needed in fluxing, is one of the most serious drawbacks of this district. It seems likely that ample bodies of unaltered sulphides will be found at some future time, in or adjacent to this district, where operations are further handicapped by very high freight rates on coke and other supplies.

Political expediency should not be allowed to longer prevent the admission of the territory of Arizona into the sisterhood of states. The territory has the population, resources and assured future that are necessary requisites of statehood, and should no longer be kept in leading strings, when both able and willing to conduct its own affairs as an independent commonwealth.

ARKANSAS. Tetrahedrite and tennantite occur in the Kellogg mine, Pulaski county, only ten miles north of Little Rock, the capital of the state. These are not commonly considered as commercial ores of copper, owing to their refractory nature and the highly deleterious effects of both antimony and bismuth upon finished copper, even in small amounts. Antimonial and bismuthiferous ores are rarely worked, unless carrying considerable values in silver, as is the case at Butte, in Algeria, and at other points.

CALIFORNIA. There are few states in the American union more richly endowed with copper than California. To give the names of all the counties in which copper is mined or found would be nearly equivalent to calling the roster of the state, as there are but few in which ores of the metal are not found in more or less profusion.

It may be said, in a general way, that there are two copper belts in the state, one following the Coast Range mountains, while the other is found in the foothills of the Sierras. Both belts have a north and south trend, and extend through practically the entire state. The Sierran belt reaches from Oregon on the north, through the counties of Lassen, Plumas, Sierra, Nevada, Placer, El Dorado, Amador, Calaveras, Tuolumne, Mariposa, Madera, Fresno, Tulare, Kern, Los Angeles, San Bernardino, and Riverside, to the Lower California line. The Coast Range belt extends from Del Norte to San Diego, across the state from north to south. In Kern county there is an apparent branching of the Sierran copper range, with an offshoot that traverses Inyo and San Bernardino counties, then enters the neighboring territory of Arizona, thus establishing a close geological and geographical connection between the copper measures of Arizona and California.

The Californian copper beds are found in close proximity to the goldfields, and much of the copper ore carries considerable values in gold. In the northern part of the state the gold and copper veins are apparently interwoven. There are ample evidences of intense volcanic action in this section, and in Shasta and adjoining counties the copper deposits are almost invariably auriferous to a profitable extent.

The first Californian copper mining was done in 1860, at Copperopolis. Considerable ore was shipped to New York, Baltimore and Swansea for reduction, and in 1863-1866 no less than nine small smelters were built in the state, copper production reaching nearly 2,000,000 pounds in 1864. The great fall in price brought operations to a stop in 1867-68, and almost no copper mining was done after that time until 1895, when an English company [illegible] Iron Mountain mine in Shasta county, and in [illegible] one of the world's great copper producers.

[illegible] several other districts of promise, Shasta county [illegible] the scene of the greatest activity [illegible] half a mile to four miles [illegible] two miles, and a proven [illegible] longer. The belt has [illegible] the western end. The [illegible] and granite and quartzite [illegible] lenses of low-grade [illegible] beds of gossan. [illegible] by the Mt. Shasta [illegible]

As a rule the alteration zone of Californian copper deposits is comparatively shallow. While the high-grade oxidized ores are found in large quantities at surface and for a little depth, the unaltered iron-sulphides usually come in at a depth of about one hundred feet, hence the big mines of the state will be, like the Mountain, low-grade mines operated on a very large scale.

Next to Shasta the copper producing counties of California rank in about the following order of importance: Calaveras, Fresno, San Berdardino, Kern, Mariposa, Madera, Merced, Stanislaus, Amador.

Native copper has been found at Napoleon, Calaveras county; at Cosumnes, Amador county, and elsewhere.

COLORADO. With the exception of an extensive plateau in the eastern part of the state, Colorado is heavily mineralized at nearly all points, and while gold and silver have been most extensively exploited, copper, iron and the other minerals exist in abundance in many parts. Copper ores are found in the counties of Boulder, Chaffee, Clear Creek, Custer, Gilpin, Gunnison, Hinsdale, Huerfano, Lake, La Plata, Ouray, Park, Pitkin, Rio Grande, San Juan, San Miguel, and Summit.

The production of refined copper by Colorado mines has run up into the thousands of tons for some years past, but almost without exception this has been secured as a by-product from the smelting of gold, silver and lead ores. The sulphide ores predominate and are found at many points. At present a number of copper mines are being opened, mainly in San Juan county near the New Mexico border, and in the northern part of the state near the Wyoming line.

CONNECTICUT. There are two copper mines in Connecticut, from which ore has been produced occasionally during the past century, these being the Newgate at Granby, and the Bristol in the town of that name, but both are idle at present. Malachite, bornite, chalcocite and chalcopyrite are found at Bristol; cuprite, malachite, chalcocite and bornite are found at Cheshire; chalcopyrite occurs at Middletown, New Britain, Roxbury, Bolton, Brookfield, Sunsbury, Litchfield and other points, and native copper is found at Farmington in red sandstone. A 200-pound mass of native copper was found in alluvium near New Haven. Copper ore was also found near Montville in 1902.

DELAWARE. Chalcopyrite has been found in the quarries of the Wilmington Granite Co., on the Brandywine river, near Wilmington, but no workable deposits of copper ore are known to exist in this state.

FLORIDA. No important or workable bodies of copper ore are known to exist in this state, but small veins of sulphide ores have been found at several different points.

GEORGIA. Copper ores exist in the counties of Fannin, Lincoln and Rabun, and probably in other parts of Georgia. Considerable chalcopyrite is found in Fannin county, at a point only two miles distant from the copper mines of Ducktown, Tennessee. At present there is but one active producer of copper in the state, this being the old Magruder mine, now owned by the Seminole Copper Co., but reopening work is being done at the Canton mine, and a small amount of work is under way at other points.

IDAHO. Although Idaho has never been a large producer of copper, the state possesses important deposits of ore at several points, and a large amount of development work is now under way. Copper ore is found in the counties of Alturas, Brigham, Custer, Idaho, Lemhi, Shoshone and Washington, and possibly elsewhere, as the entire state is richly endowed with metals, and the exploration and development of its mineral wealth has been by no means commensurate with the opportunities. The principal copper developments of the present are in Custer, Washington and Lemhi counties. The ores are mainly carbonates and sulphides, though other forms occur and native copper has been found in the sluice-boxes of the gold mines at Murray.

There was much interest aroused in the Seven Devils district a few years ago, but for some reason that does not seem quite clear, this district with the diabolical name has failed to develop any regular copper producers, though ore of the best grade has been found. Sooner or later there should be some good mines opened in this district.

The principal copper mining operations of the present are carried on in Custer county, by the White Knob company. A vast amount of work has been done at this point, and while the ore is of low grade it is hoped that the mining may prove profitable, by reason of operating on a great scale.

The Coeur d'Alene copper district is receiving some attention at present, and has a number of promising prospects. Although silver-lead mines have been operated for years in this district, it was not until 1898 that any attempt was made at copper mining. At present there is a considerable activity in this field, though none of the copper mines have passed beyond the stage of prospects.

ILLINOIS. Native copper, occurring as drift, in the alluvium, is of rather common occurrence in Illinois, but is, of course, of no commercial importance. The only deposits of copper ore in place known in the state are in Hardin and Chittenden counties. Chalcopyrite has been found in fair quantities near Rosiclare, Hardin county, and during 1902 considerable copper was found, in connection with lead and spar, in Hardin and Chittenden counties, and an attempt was made at organizing a company to open a mine.

KANSAS. The rock strata of Kansas range from carboniferous to tertiary, but the igneous rocks are lacking, and without them there seems slight likelihood of discovering important copper deposits. A little chalcopyrite in tetrahedral crystals has been taken from the lead and zinc mines of Galena, Cherokee county, in the southwestern corner of the state.

KENTUCKY. A little chalcopyrite has been found in Livingston and Union counties, but the deposits do not promise to be of any special value industrially.

LOUISIANA. No copper deposits of industrial importance are known in this state, but there is an interesting occurrence of chalcopyrite in a peak deposit of galena, sphalerite and baryte in halite (rock-salt) on Belle Isle, near the mouth of the Atchafalaya river.

MAINE. Some of the earliest copper mining in America was done in the Pine Tree state, and a smelter was built at Taineston previous to 1840. Chalcopyrite is found in the lead mines at Lubec, also near Dexter, and in Sullivan, Franklin, Hancock, Topsham, Parsonfield, Whiting and elsewhere. Chalcopyrite, chalcocite, bornite, cuprite and tetrahedite occur at Blue Hill. There are old copper mines near Calais, on the New Brunswick border, and about 1880 there was a local copper boom that led to the opening of mines at Blue Hill and Sullivan, in Hancock county, but these did not prove profitable or long-lived.

MARYLAND. Copper mines were worked in this state in colonial days and during the first half of the nineteenth century. There are three cupriferous measures of some little extent, and the copper mines of Maryland were actually of some importance as producers, until the discovery and exploitation of the rich native metal mines of Lake Superior put a quietus on copper mining along the Atlantic seaboard.

The Maryland ores are mainly chalcopyrite and bornite, with occasional malachite. Of the three principal districts of the state, the most important is in Frederick county, running along the Linganore hills, from New London northward to a point beyond Libertytown, the ore occurring in slates and limestones. The second district, in Carroll county, is found mainly between Sykesville and Finksburg, with the ore in slates. The third district is in Baltimore county, at Bare Hills, where sulphide ores are found in hornblende gneiss.

MASSACHUSETTS. There is more or less copper at various points in the Old Bay State, and fitful attempts have been made at opening mines, but none have resulted from the short-lived operations. A little native copper is found in some of the triassic sandstone strata, and chalcopyrite is found in the lead mines at Southampton, also near Deerfield, at Turners Falls, Hatfield, Sterling, Rowe, Leverett, New Marlborough and Russell, also chalcopyrite and tetrahedrite at Newburyport. Prof. W. O. Crosby, of the Massachusetts Institute of Technology, furnishes me with particulars regarding the new copper prospect opened in western Massachusetts in 1902, a description of which will be found under the name of the New England Mining Co.

MICHIGAN. While the Keweenawan formation of Lake Superior outcrops in Wisconsin and Minnesota to the west, and upon the Canadian shore of Lake Superior as well, the developed and productive mines of the district lie wholly within the limits of the state of Michigan, Copper ores are found in the granite lying north of the iron belt in Marquette county, and one mine is being developed thereon, but for all practical purposes the copper belt of Michigan is contained in the three counties of Keweenaw, Houghton and Ontonagon, stretching from east to west, from the point of the Keweenaw peninsula along the mainland of the western half of the southern shore of Lake Superior. There are also abandoned copper mines on Isle Royale, which is now practically uninhabited except in summer. The Keweenawan formation stretches through Gogebic county, and across the Wisconsin line into Minnesota, but there never have been any producing mines west of Ontonagon county.

The formation carrying the cupriferous lodes and veins of the Lake Superior district is composed of old lava flows, supplemented by beds of conglomerate formed by the deposition of rocks, broken from adjacent shores, upon old sea-beds. This belt of Keweenawan rocks, so called from its predominance in the Keweenaw Peninsula, where first noted by early geologists, is of considerable extent. It forms a trough, or synclinal, the southern edge outcropping on the Keweenaw Peninsula and to the westward along the southern shore of the lake, and it is with this southern edge that we have to do. The other outcrop of the rock strata forming this trough is noted on Isle Royale, and on the northern shore of the greater part of the western half of Lake Superior; also on the southern shore of the lake in Douglas county, Wisconsin, and again on Michipicoten island and the adjoining northern shore, at nearly the extreme eastern end of Lake Superior. The axial line of the synclinal seems to run somewhat north of east, but there is marked diversity in the trend of the southern outcrop where mining is actively prosecuted, the strike ranging from nearly due East and West to North 30° East in the Portage Lake district. Broadly speaking, Lake Superior rests in the trough of the Keweenawan series.

Discarding further consideration of the northern outcrop of the series, where the dip is to the southward, it may be said that the dip of all of the southern outcrop of the Keeweenawan beds is to the northward or northwestward. The cupriferous strata on the Keweenaw peninsula have sandstone to either side. The underlying sandstone, to the east and south, is generally held to be unconformable with the traps of the Keweenawan group, and has been identified by Dr. L. L. Hubbard as of the Potsdam series. Copper is occasionally found in the eastern sandstone, near the point of contact with the trap, where evidences of igneous influence are quite plainly discernible; and in Ontonagon county fine copper has been found in the overlying sandstone conglomerate of the Porcupine mountains. The western sandstone is superimposed upon the Keweenawan beds and is apparently in place.

The outcrop of the Keweenawan formation, between the two sandstones, is from two to six miles wide, roughly speaking, and is narrowest where the dip of the strata is greatest, and widest where the strata dip least sharply. Toward the middle of the Keweenaw peninsula the western sandstone is lost under the lake, and at Bete Gris bay the eastern sandstone also plunges beneath

Lake Superior, leaving the traps and conglomerates in sole possession of the tip of the peninsula for the last ten miles, the waters covering the entire formation at the end of Keweenaw Point.

The Keweenawan series consists of three elementarily distinct classes of rock, though the subdivisions are numerous. These principal groups are the traps, amygdaloids and conglomerates. The two former are old lava flows, while conglomerates are composed of broken rock, sand and gravel, cemented by pressure, and were once seabeds. The traps and amygdaloids are in many respects similar, the main difference being in the greater density and uniformity of the traps. The copper is found in a chemically pure, or native state, in the amygdaloids and conglomerates, and occasionally, to a limited extent, in the traps. The theory most commonly held is that the copper was dedeposited by precipitation in the cavities in the strata from the waters of a sea above. The traps being dense rocks, usually basic, there was little chance for the deposition of copper therein. The amygdaloids contained an infinite variety of granular and crystalline rock forms, the calcareous and silicious portions of which were dissolved quite readily by the waters, presumably powerfully impregnated with salts, and in the apertures left by the dissolution of the chalky and sandy nodules, the copper was deposited when precipitated from the waters above. There is also a theory that the copper is purely of igneous origin.

A cross-section of the formation at any given point would show a large number of trap, amygdaloid and conglomerate strata, lying one upon the other, from south to north. These vary greatly in thickness, but are persistent both as to length and depth. There must necessarily be an end to even the greatest lava-flow, and owing to inequalities existing on the land-surface or sea-bed over which these old flows spread, the stratum may be temporarily cut out, to reappear at greater depth, or to the sides of the point of disappearance.

Geological observation in the Lake district has been founded very largely on the conglomerates as base-lines, and many conglomerate reefs have been identified and traced for considerable distances. This system of geological identification is obviously correct, as the conglomerates differ more radically from the traps and amygdaloids than do the latter from each other. All of the various strata of traps, amygdaloids and conglomerates vary from each other to a greater or less extent, according to their chemical and petrographical formation, crystallization, and alterative influences to which they were subjected after their original deposition. Some of the traps are blue, others greenish in color, with various minerals added to the original diabase, such as augite, prehnite, calcite, and others. In addition to the diabase, there are felsite and porphyritic rocks, richer in silica.

Of the conglomerates, many carry copper in minute quantities, but only two have been mined, these being the Calumet and Allouez conglomerate reefs. Nearly all the amygdaloids carry copper to some extent, but not all have it in sufficient quantity to render mining profitable. With the exception of three mines working on conglomerates and two on veins, all the active mines of the district, including producers and properties in process of development, are opened on amygdaloid lodes.

In addition to the main portion of the Keweenawan series, which consists principally of eruptive rocks, a second division, mainly of sedimentary rocks, was formed at a later period, and in this second division the Nonesuch mine, in the Porcupine Mountains, was opened and found very rich in fine copper. The second division of the Keweenawan series was formed mainly by the breaking down of the eruptive rocks of the preceding formation, and the redeposition of the detrital rock so secured in the form of conglomerates and sandstones.

The crystalline rocks stand higher than the adjacent strata that had less power of resisting the elements and glacial action. These latter have been much eroded in ages past, in consequence of which the copper-bearing belt forms a ridge rising from 400 to 800 feet above the level of Lake Superior, with the sandstone sloping to the water from either side. In many places, especially at the crests and escarpments of the igneous strata, the naked rock stands out strongly, but the lower portions are covered with drift. In places an overburden of 200 or more feet of sand is found surmounting the rock, and swamps above the ledge of solid rock are of frequent occurrence. These are serious obstacles to the locating of mineral deposits, and also hinder the geological exploration of the district.

The dip of the various strata, copper-bearing and otherwise, varies greatly at different points, ranging from 73° with the horizon at the Baltic, to as flat as 25° at the Arnold. In a general way the dip of the trap series is sharpest when the trap belt, as exposed at surface, is narrowest; and flattest where the trap formation is widest. In a general way it may also be said that the dip of the strata is sharpest nearest the eastern sandstone and flattest nearest the western sandstone, an evidence of a folding or pushing force exerted from the direction of the eastern or Potsdam sandstone. The contact of the eastern sandstone is much tilted from the apparently horizontal position occupied a little further east, the sandstone standing almost vertically at some places where adjoining the eruptive rocks.

In addition to the copper-bearing amygdaloids and conglomerates, there are other sources of copper supply of minor value. The first of these in importance, judging from the amount of copper produced in the past, is found in the fissure veins. These cross the formation at approximately right angles and as a rule are nearly vertical in dip. The copper in these was presumably deposited in the same manner as the crevices in the amygdaloids and traps were filled with the same metal. The second source of copper is in the contact veins, of which the old Minnesota mine affords much the best example. The third source of copper is found in the ores. The Cliff, the first and one of the greatest dividend-payers among Michigan copper mines, was opened originally as a mine of black oxide of copper. The Calumet & Hecla was noted, when first opened in 1866, for the large amount of malachite found in the conglomerate near surface but in this instance the carbonate had been formed by the action of the elements from the native copper, which replaced it at a little depth. Various fissure veins of copper ore have been found, especially on Keweenaw Point, well toward the eastern end.

The existence of native copper on the southern shore of Lake Superior was first made known to the world by the intrepid Jesuit missionaries of France, who visited the unknown inland sea early in the Seventeenth century. Native copper was found by other explorers in that and the succeeding century, and in 1770 one Captain Jonathan Carver printed a book in London, telling, among other things, of the richness of Lake Superior in copper, which had but to be picked up and carried away. This led to the formation of a copper mining company in London, and a party of miners sent over from England worked on the banks of the Ontonagon river in the winter of 1771–72, under the direction of Alexander Henry, an adventurous Englishman who had turned hunter, trapper and finally miner. A long adit was driven in a clay bank; this caved in when the rains came in the spring, and no further attempts were made at mining copper for seventy years.

In 1830 the southern shore of Lake Superior was first visited by Dr. Douglass Houghton, of Detroit, a young scientist combining with his technical skill rare and valuable courage and practical knowledge of men and matters. Through his indefatigable efforts the upper peninsula of Michigan was first surveyed, and the discoveries of Dr. Houghton led to the exploitation of both the copper and iron measures of the Lake Superior district, now among the most valuable and productive mineral fields of the world. The first "miners" to reach the Lake Superior copper fields were Jim Paull and Nick Miniclear, two backwoodsmen who came overland from southern Wisconsin in midwinter, suffering great hardships, and arrived on the shore of the great lake in March, 1843. The federal government opened a land office at Copper Harbor in the same year, and a number of hardy prospectors begun work before navigation was closed by the storms of early fall. More miners, most of whom were devoid of practical knowledge, arrived in the following year, and as the news of important discoveries became bruited about, the first Cornish miners arrived to do real mining. The operations of the first two or three years were productive of little but knowledge, secured by mistakes that now appear ridiculous. The first copper in any quantity of importance was taken from a vein of melaconite in Keweenaw county in 1846; the same company opened a fissure vein of native copper a little later, and begun the payment of dividends in 1849, since which time there have been dividends paid in each successive year by Lake Superior copper mines. But little later than the early operations of the Cliff company in Keweenaw county were the pioneer operations of the Minnesota company, in Ontonagon county, at the other end of the district. Extensive remains of prehistoric mines were found at many points, and a number of the best mines of the district have been developed on lodes revealed by lines of old pits.

In the earlier years of development the profitable mines were opened on fissure veins in Keweenaw county, and on the contact veins of Ontonagon county. The middle, or Portage Lake district, was held to be of little promise, and the attempts made to open paying mines on the stratified beds were regarded with amused contempt by the successful operators of vein mines, until at last the Quincy mine made a success of an amygdaloid lode. At present all but two of the active mines of the Lake district are opened on stratified beds, and of the two remaining mines, one is equipping a mill to treat copper from fissure veins in Keweenaw county, and the other is reopening the old contact vein of the Minnesota mine in Ontonagon county, in addition to developing a new mine on an amygdaloid bed.

MINNESOTA. The western continuation of the Keweenawan cupriferous formation extends from the upper peninsula of Michigan across northern Wisconsin into Minnesota. The Keweenawan rocks are found in Cook, St. Louis and Pine counties in the northeastern part of the state and short-lived attempts at prospecting have been done in all three counties. Native copper and malachite have been found in Chisago county. An occurrence of copper of geological interest, though of no commercial importance, was noted in St. Louis county in 1900, when the Montana shaft of the Minnesota Iron Company yielded about 100 pounds of native copper, found in sheet form imbedded in iron ore, at a depth of about 300 feet.

MISSOURI. Carbonate and sulphide ores occur at a variety of points in this state, and a number of small mines have been opened, though none are now working. Native copper and various ores are found in the Stanton mine in Franklin county. Malachite, azurite and chalcopyrite occur in the Circle Diggings of Cole county, and at the Collins mine in Cooper county. Malachite has been found in the Cherry Valley mines of Crawford county. A little chalcopyrite is found at times with the sphalerite in the zinc mines of the Joplin district, in Jasper county. The O'Bannon and Buckeye mines at Fredericktown, Madison county, were once worked for copper, and while in the Catherine lead mines, near Fredericktown, in October, 1902, I secured a little chalcopyrite from magnesian limestone carrying disseminated galena. Chalcopyrite has been found in Jefferson county, and Shannon county had a short-lived copper boom in 1901.

The Cornwall and Swansea copper mines were opened in 1863 on parallel blanket veins of disseminated chalcopyrite with chert gangue in a country rock of silurian limestone. The southern half of the state, from the Mississippi river to the Kansas line, possesses great mineral wealth, and while the principal developments will probably be in lead, zinc and iron, the opening of a profitable copper mine is by no means impossible, as the southern Missouri formation of magnesian limestone of carboniferous age, intruded by granite and porphyry, is one that has given to the world some of its best copper mines in other fields.

MONTANA. The Butte camp of Silver Bow county is now, and for several years has been the largest producer of copper of any district in the world. Copper ore is found in the counties of Beaverhead, Cascade, Deer Lodge, Granite, Jefferson, Madison, Meagher, Lewis & Clarke, Park, Silver Bow and Teton. A little mining is done outside of Silver Bow county, and in these districts the ores are mainly sulphides, usually in association with diorites appearing as intrusives in a quartzite country rock of Cambrian age.

The Butte camp is approximately a rectangle of four by seven miles, but the more important mines and principal production are in an area of little more than two square miles. From this little spot has come hundreds of millions of dollars worth of copper, silver and gold, and under normal circumstances the production of this district, small only in area, is not less than 10,000 tons of refined copper monthly—an amount fifty per cent greater than the output of any other cupriferous district of the world.

Butte was originally a placer gold camp, but as such was of small importance and short life. Silver mines were opened later, and these turned into copper mines at depth. As early as 1880 the Parrot and Boston & Colorado mines were making argentiferous matte, and in the following year was begun the great development that transformed Butte into the world's greatest copper camp within a decade.

The country rock of the Butte district is granite, of which the Butte granite is the elder and the Bluebird an intrusive. The ore bodies are of very irregular form, occurring in veins ranging from mere seams up to 100 feet in width, with many bulgings and pinchings from point to point, but with a general tendency toward greater width at depth. The veins are considerably faulted and cut by horses of dykerock. The walls are poorly defined in many cases, and this gives rise to the plausible theory that the veins have been formed along a series of small fissures marking a line of disturbance, rather than from a general faulting, and that these small fissures have been greatly enlarged at many points by replacement of the original walls. The veins are nearly all mineralized and form a veritable network underground, crossing, interweaving, pinching, enlarging and behaving generally in the most erratic manner. The damnable mining laws of the United States are peculiarly adapted to the fomentation of mining litigation, and as a consequence of the physical and scientific impossibility of determining the apices of many of the veins, the principal mining interests of this district have become entangled in a maze of lawsuits that cannot be settled during the lifetime of the present generation, unless the litigants can arrive at some understanding out of court, or the weaker parties be driven to the wall. That the mines work and earn good profits after paying the millions spent in litigation is strong evidence of the richness of the district. In a camp like Butte, every mining claim should carry its title to the side-walls, and not an inch beyond. Any other system, and most especially such a cumbersome and dishonest system as furnished by the present federal mining laws, is an incentive to rascality, a discouragement to legitimate mining, and a disgrace to the country responsible for laws so utterly at variance with common sense and common honesty.

The gangue of most of the ore bodies is granitic or silicious. A little native copper is found in the granite at points. In the case of most mines of the district the upper levels carry high values in silver with only a trivial amount of copper, the latter averaging one per cent. or less. This oxidized zone has a depth of 200 to 400 feet as a rule. Below this there is a median zone, frequently characterized by veins almost or quite barren of either copper or silver values in the upper section, followed by the richer sulphides. This middle zone varies greatly in characteristics in different shafts. The third or lowest zone is found at about the water level, where the ore becomes unaltered iron sulphides. Unfortunately for the peace of mind of geologists and mineralogists, the Never Sweat mine is now producing the extremely rich ore chalcocite from its 2,200 foot level. This occurrence does not fit in with any of the generally accepted theories of copper deposition, which is bad for the theories. Below the permanent water level the ore bodies, while retaining full width and strength, give constantly decreasing copper values with added depth. The deepest shaft in the Butte district is now down nearly a half mile, and, excepting the chalcocite in the Never Sweat, the percentage of copper decreases in a fairly steady ratio as depth is gained. The Anaconda, which started with 55 per cent ore, is now averaging but a little over 3 per cent copper. There are still lower grade deposits of immense area in the district, as at the Modoc mine of the Anaconda and elsewhere, and in view of the great improvements in metallurgical processes made during the past decade, such ores may be used eventually. While Butte is most distinctly working into a lower grade camp each year, it must not be inferred that the high grade ores are exhausted. All of the big mines have considerable reserves of rich ore, other high grade ores are locked up by litigation, and still others are being developed every year.

Mining developments of the past two years in the flat east of the city indicate that the productive area of the district will be greatly increased, and possibly doubled, in the future. While Butte is no longer the high grade camp of ten years ago, and at least one of its great mines has probably passed its zenith, the district is by no means decadent. It is not likely that any man now living will survive to see the last ton of copper made by Butte mines, nor even live long enough to draw the last dividend paid by a Butte copper mine.

NEVADA. The development of silver mines of fabulous richness, coupled with political exigencies, brought Nevada into statehood, some forty years ago. Beyond working the silver bonanzas along the extreme western edge of the state, there was little mining development attempted, though prospectors brought in reports of rich discoveries from every county. Lack of railroad lines, coupled with a sparse population and mountainous topography, discouraged exploration, and for these, and possibly other reasons, Nevada has received less attention from the miner than any other of the western mining states. Of late this old order of things seems to be changing, and better times are in store.

Copper ore is reported from the counties of Elko, Esmerelda, Eureka, Humboldt, Lander, Lincoln, Nye, Storey and White Pine. Mines are now being developed, and while operations are upon a rather small scale at most of them, promising properties are being opened in several cases. The state is still most inadequately supplied with railroads, wagon-roads and people, and these drawbacks will deter the development of copper mines until partially overcome, but it is probable that the future will see an increasing interest in the mining of copper, as well as of gold and other metals, especially as Nevada lies between California and Utah, two of the richest mineral states of the Union, and the general geological conditions are much the same in these states and Arizona as in Nevada.

NEW HAMPSHIRE. Copper ores are noted at a number of points in this state, more especially in Grafton county. There are also deposits of apparently considerable extent in the Mt. Gardner district, near Woodsville, and chalcopyrite has been found at other points, including Franconia in the White Mountains, where the ore occurs in gneiss.

NEW JERSEY. The first copper mine in the United States was opened in New Jersey, and this, the old Schuyler mine, discovered in 1719, is now being worked by the Arlington Copper Company. The Schuyler was worked upon what was considered a large scale in those days, and made its owner wealthy. Work was suspended when the Revolutionary War begun, and the mine has never been steadily worked since that time, although it has been operated spasmodically on several occasions.

Ore deposits of low grade are found at a number of points in this state, and there is considerable native copper in the vicinity of Somerville, Flemington and New Brunswick. There are also old copper mines at Belleville, Griggstown and New Brunswick, most of which were small and unsuccessful. As the known deposits of ore and native copper in this state are of low grade, it is obvious that success can be secured only by the operation of mines upon a fairly large scale.

NEW MEXICO. Native copper has been found in the Santa Rita mines of Grant county, and copper ores are found at many points in the state, having been noted in considerable quantities in the counties of Grant, Lincoln, Rio Arriba, Santa Fe, Sierra, Socorro and Taos. General geological conditions are favorable to the finding of profitable mines, and there are several properties of considerable magnitude and good promise, notably the Aberdeen, at Lordsburg, which is a dividend-payer, the Santa Fe, Santa Rita and others. There is much prospecting for copper in progress, and a number of mines are being opened in the various counties. New Mexico has had a rather poor standing among mining men for the past fifteen or twenty years, due to some large failures scored in the territory in early copper mining ventures, but these seem to have been the fault of general conditions rather than to have come from the lack of ore. The first mining ventures were carried on under great disadvantages, and it is unfair to the territory as a whole to condemn it because of the failures of a few mines. There are many more failures than successes, even in the best copper mining districts of any state or country, and in the neighborhood of the greatest successes will nearly always be found the biggest failures.

NEW YORK. The Empire State has no copper mines, although copper ores have been found at a number of points. Chalcopyrite is found at the Ancram and Beckee lead mines in Columbia county; at Ellenville and the Red Bridge lead mines in Ulster county; with arsenopyrite near Wurtsboro, Sullivan county; in Chester, Warren county; Eastchester, Westchester county; Crown Point, Essex county; Alexandria and Antwerp, Jefferson county; Salisbury, Herkimer county, and at Canton, Fowler and the Rossie iron mines in St. Lawrence county. Malachite and cuprite occur at Ladentown, Rockland county, occuring in thin seams in the trap, and azurite, malachite and chalcopyrite have been found near Ossining, Westchester county.

NORTH CAROLINA. This is an important state, rich in mineral resources, and although it has never been a considerable producer of copper, may become such in the future, as its ore measures are of large extent and decidedly promising at some points. The state had several small copper mines in regular operation before the Civil War, and has been a regular though small producer of the metal for some years past. In view of the present interest in copper mining in this state it seems probable that the production will be increased by the making of several mines of fair size.

So far as can be determined by the limited geological research given many of the counties, and the developments to date, the most important copper measures of the state are contained in the counties of Ashe, Rowan, Person, Cabarrus and Granville, but copper ores are also found in the counties of Alexander, Alleghany, Caldwell, Catawba, Chatham, Clay, Davidson, Gaston, Guilford, Jackson, Lincoln, Madison, Mecklenburg, Mitchell, Montgomery, Moore, Rockingham, Swain, Transylvania, Watauga, Wilkes and Yadkin, and very possibly in several others as well. The ores are mainly sulphides, considerable chalcocite being found in Ashe and adjoining counties, but native copper has been found at the McCulloch mine in Guilford county, and all of the commercial ores of copper are found in the state, as well as a long list of the minor ores. The variety of copper minerals noted in North Carolina is probably nearly or quite as great as in Arizona.

The Virgilina district, on the border of Virginia and North Carolina, and including the counties of Person and Granville in the latter-named state, has sulphide ores occurring in lenses longitudinally, and apparently in series vertically, as proven by developments to about 300 feet in depth. The Virgilina district is in the sub-Piedemont division of the Appalachian belt, and in the same division, considerably further south, is found the Gold Hill district, where there has been considerable development, and where the ores apparently hold their full values to the greatest depth reached, which is slightly under 1,000 feet, the ore running 1 to 10 per cent copper, 2 to 4 ounces silver and about $2 per ton in gold. The area of the Gold Hill field, as far as determined, is about 25 miles in length by one mile in width. The chalcopyrite occurs in quartz and a decomposed schist.

OHIO. Native copper nuggets brought down from Lake Superior by glacial action are frequently found in the drift in this state, and native copper nuggets and ornaments are taken from the mounds built by a prehistoric race, but such occurrences are not of industrial value, and are of but slight geological interest. So far as reported, no trace is found of any copper deposits in place in the state.

OKLAHOMA. Copper ore has been found in small quantities at several points in this territory, but so far as known none of the discoveries are of much promise. A little excitement was caused late in 1901 by the finding of copper ores in the hills of Wood and Woodward counties, but nothing came of the discoveries.

OREGON. Copper ores are found in a number of districts in this state, notably in the counties of Baker, Grant and Josephine. The St. Helens district is regarded as of promise. In Josephine county, just north of the California line, the copper belt of that state continues into Oregon, general conditions being similar to those in Del Norte county, California. The Dietrick district in Josephine county is the scene of some little activity in copper development at present, The ore in this district carries good values in gold and silver, as well as high percentages of copper, and the veins are said to be of good width. The Burkemont district is in eastern Oregon, and is apparently a continuation of the Seven Devils district of western Idaho, which it adjoins. There are considerable bodies of low-grade ore in this district, and it is evident that profitable mines can be made only by large development and the steady production of a large ore tonnage.

PENNSYLVANIA. Although copper mining was undertaken in Pennsylvania more than a hundred years ago, the state yet lacks a copper mine. The earliest attempt in this line was at the Gap mine, in Lancaster county, which was opened as a copper mine in the eighteenth century, and was a failure as such, but was reopened as a nickel mine about 1850, and was successfully operated for that metal, with a small incidental production of copper, until 1893, when the richer mines of the Sudbury district of Ontario brought about a fall in the price of nickel that closed the Gap. There are copper ores at a number of points, mostly in small quantities. Native copper, chalcopyrite, azurite, malachite, chrysocolla, cuprite and brochantite are found at Cornwall, Lebanon county. The Perkiomen mine in Montgomery shows as long a list of copper minerals. In an abandoned lead mine at Schuylkill, Chester county, a variety of ores and native copper occur, and chalcopyrite is found in the Elizabeth mine at Norwich, in the same county. Native copper and cuprite have been found near Gettysburg. Native copper, malachite, chrysocolla, chalcopyrite, cuprite, melaconite and aurichalcite occur at Jones's mine, Morgantown, Bucks county, and malachite has been found at New Britain in the same county. Oxide, carbonate, sulphide and silicate ores have been found in small quantities in the quarries of Frankford, a suburb of Philadelphia. Bornite has been found in York county, and sundry ores are reported from Montgomery county. A little prospecting for copper has been done during 1902 in Pottstown and also at Tunkhannock.

RHODE ISLAND. There are no mines of copper in this little state, but chalcopyrite ore is found at Portsmouth, and malachite, azurite, bornite and chalcopyrite occur at Cumberland, while malachite, azurite and chalcopyrite have been found at Johnston.

SOUTH CAROLINA. Chalcopyrite has been found in the Fair Forest gold mines, in Union county, but, so far as known, there are no copper deposits giving promise of making mines within the limits of the state.

SOUTH DAKOTA. In the southwest corner of the state of South Dakota, arising from an extensive plain and isolated geologically, is the peculiar mountainous region known as the Black Hills. These mountains are a veritable storehouse of nature's mineral wealth, and there are but few metals not found here in greater or less profusion. The presence of copper was noted by early explorers, but in the all-consuming search for gold the other metals were neglected until a few years ago. Copper ores are in demand at the local smelters for use as fluxes in reducing refractory gold ores, being preferable to the barren fluxes that would otherwise be necessary. Geologically, the copper measures of the Black Hills have been compared by several scientific observers with those of the Ducktown district of Tennessee. The principal mining developments have been made in Pennington county, where several copper mines are now being developed.

TENNESSEE. The proven copper deposits of Tennessee occur in Polk county, in the extreme southeastern corner of the state, although the discovery of high-grade copper ore was reported from Lawrence county late in 1902. A little native copper is found in the Ducktown mines, but the important source of supply is chalcopyrite. The Ducktown district was discovered circa 1840, and as early as 1854 there were two blast furnaces in operation at that point. A thriving industry had been built up and the prosperity of the district seemed assured when the Civil War brought mining and smelting to a standstill, and work was not resumed until some years after the war, and then in a small way only. A British syndicate did the first post-bellum work, and has been followed by a strong American company. The copper industry of the Ducktown district seems to be on an assured footing again, with every prospect of growth in the future.

TEXAS. A little native copper is found in Burnet and Llano counties, and there are ores of chalcopyrite in both counties, as well as argentiferous tetrahedrite in the latter. Carbonate and silicate ores are exposed at a number of points along the Brazos river, in the Permian sandstones. Malachite and azurite,also chalcopyrite and bornite, in a quartz gangue, have been found in a prospecting shaft four miles north of Llano, the ores carrying 0.11 ounces of gold and 2.5 ounces silver per ton. A hand-picked sample of tetrahedrite from Babyhead Mountain, Llano county, gave 107.8 ounces silver and 6.4% copper. The White Eagle Copper Company, operating in Burnet county, has developed a mine by shaft and an open cut. It is probable that copper ores will also be found in several other counties of the Texas mineral zone.

UTAH. Copper has long been produced from Utah mines, but until quite recently the metal has been obtained only as a by-product from the smelting of gold and silver ores. With the development of the Utah and Bingham mines of the West Mountain district of Salt Lake county, a new era has been entered upon, and Utah's copper output is increasing rapidly. The principal producers are in Salt Lake county, but there are very promising properties in process of development in Beaver county, and there are also copper ores and occasional exploitations in the counties of Juab, Piute, Summit and Tooele.

The mines of the West Mountain district are of exceptional promise, and are already considerable producers. All of them carry gold and silver in sufficient quantities to materially reduce the cost of copper production, and greater attention is being paid to copper-bearing veins in the older mines, some of which are proving valuable. Some of the properties in Beaver county are among the most promising to be found anywhere, at a similar stage of development. Utah has long been one of the solid mining states of the Union, and its mines, largely developed and owned by local capital, until within the past few years, have an enviable record of dividends. Some of the newer copper mines of Utah are in a position to make copper so cheaply, owing to the gold and silver secured as by-products, that Utah must be included in any possible list of the important copper-producing districts of the world.

VERMONT. There are deposits of chalcopyrite at South Strafford, Vershire, Waterbury, Shrewsbury, Berkshire and Corinth in this state, and copper mines have been operated in the past in three districts, at Vershire, South Strafford and Berkshire. The Ely mine had a smelter at Vershire circa 1861–1870, and worked with more or less regularity, but was forced to go out of business by the greatly decreased price of copper following the Civil War. The Elizabeth mine at South Strafford and the Ely mine at Vershire are now in the hands of George Westinghouse, of Pittsburg, and a limited production was effected in 1901–1902 from the Elizabeth, where about one hundred men were worked, while the Ely is being reopened and put in readiness for production. The other mines are idle. The Vermont ore is chiefly chalcopyrite, ranging from 3% to 30% copper, with an average of probably 5% to 10%.

VIRGINIA. Virginia has an auriferous-cupriferous mineral belt, stretching from the Piedemont district in Orange county to the North Carolina line. Copper ore has been noted in the counties of Buckingham, Carroll, Grayson, Fauquier, Fluvanna, Franklin, Greene, Halifax, Loudoun, Louisa, Montgomery, Nelson, Orange, and Polk. There are copper mines of small extent in Fauquier and possibly in other counties of the state, but the largest mines and principal development are found in Halifax county. The Virgilina district lies in both Virginia and North Carolina, the Virginia portion being in the county of Halifax. This district, as developed, is about twenty miles long by three miles wide, with indications of copper beyond these boundaries. The ores are chalcocite and bornite in a quartz gangue, and average possibly no more than 3%, though having frequent chutes running 20% to 30% copper. The ores of this district, as mined, average about one dollar gold and six to ten ounces silver per ton, and, with their gangue, run from 4 to 10 feet in width. There are fourteen mines in this district, of which four are producers, with the others developing or idle. The advantages enjoyed by the mines of the Virgilina district are cheap fuel and labor, an equable climate and proximity to the Atlantic seaboard, with which there is good rail communication. Several strong companies are now operating in this field, and it is likely to be heard from in the future as a considerable producer, the gold and silver values being sufficient to permit the operation of low-grade and narrow ore bodies that would otherwise offer little promise of adequate returns.

WASHINGTON. There are copper deposits in King, Stevens and other counties of this state, and a little attention is being paid to copper mining at present. None of the mines have yet advanced to a stage where it is possible to predict a certain future, but some promising prospects are under development.

WISCONSIN. There are copper ores in the zinc and lead district of southwestern Wisconsin in the vicinity of Shullsburg and Mineral Point, and some crude attempts at mining copper have been made at the latter-named town. Chalcopyrite and malachite have been found in Sauk county, and in 1902 a diamond drill boring north of Osceola gave cores assaying well in copper and with small values in gold and silver.

The northern fold of the Keweenawan trap formation extends across the Lake Superior shore of northern Wisconsin from Bayfield to the Minnesota line, carrying more or less native copper in the mineralized amygdaloids. This formation is described in the article on Michigan. A number of small shafts have been sunk on this fold of the Keweenaw formation, in Douglas county, but no mines have resulted from the work. The most extensive work was done at the Chippewa property, which came to grief financially late in 1902. A recent development, which is apparently much the most important ever made in the state, is noted in the southern end of Douglas county, where the Minong Range Copper Company is sinking two shafts in an amygdaloid. The importance of this work lies in the fact that the formation dips northward at this point, showing that the shafts are on the southern fold of the synclinal, this being the fold on which all the profitable mines of Lake Superior native copper have been opened, all mines on the northern fold having proved failures. Considerable heavy copper has been secured in one of these shafts, and the outcome will be awaited with interest, as the making of a paying mine at this point would treble the area of the possibly profitable zone of the Lake Superior copper field.

WYOMING. Although Wyoming is one of the newest copper fields of the United States it is by no means least in promise, and the Grand Encampment district has attracted wide attention, as well as the investment of large amounts of money. I am indebted mainly to Prof. Henry C. Beeler, state geologist, for the facts in the following summary of Wyoming copper deposits and prospects.

The principal cupriferous field of the state is the Grand Encampment district, having an estimated area of 2,500 miles, and lying in the southern half of Carbon county and the southwestern quarter of Albany county. The district is divided in two nearly equal parts by the North Platte river, and has the Sierra Madre Mountains to the west and the Medicine Bow range on the east. Encampment is the principal town of the district. While there were known to be promising mineral indications, little was accomplished until 1898, when gold prospecting begun. This was not especially successful, but copper prospects were located soon thereafter, and there has been increasing interest since then in copper development.

The general formation of the Sierra Madre is an irregular core of red granite, with fine-grained mica-hornblende schists of Algonkian age lying thereupon. Both schists and granite are cut at intervals by dykes of diorite and associated dyke rocks, the dykes running in apparent conformity with the strike and dip of the schists when traversing them. Associated with the schists and conformable in strike and dip are huge ledges of quartzite and altered schists known locally as lime dykes, the alterative material having been mainly lime, with some silica. Extensive evidences of replacement and alteration are frequently noted in the granite and diorite, as well as in the schists.

While the formations in general are fairly mineralized the principal ore bodies are found in the contacts between the schists and adjacent rocks, especially so in the contacts of schists and quartzite. The outcrops are usually of soft spongy limonite carrying some hematite, and often show a little quartz in the ore. These outcrops are noted on veins ranging from mere stringers to a width of 20 feet or more, and extend to water level, a depth of 35 to 100 feet. The iron oxides are usually associated with copper carbonates, the percentage of copper being small at surface and increasing with depth. A little chalcocite is found in the zone of secondary enrichment, but at or about the water level the ores change to chalcopyrite and bornite. Above the water level the altered ores are mainly malachite and azurite, with a little native copper. In several instances the outcrops are fairly pure specular or silicious hematite, associated with white quartz. In the cases where copper sulphides outcrop the same white quartz is found in association.

The district has been a producer since 1900, ores shipped assaying 30% to 49% in carload lots. This necessitated hand-selection and the rejection of the lower-grade ores. The high-grade ores carry $8 to $10 per ton in gold and silver. The district has a smelter which handles mainly low-grade ores, the product therefrom being shipped as high-grade matte. An interesting feature of this district is an aerial tram 16 miles long, in four sections, running from the Ferris-Haggerty mine to the Encampment smelter, this being in successful operation.

The Medicine Bow range on the eastern side of the Encampment district has been prospected for years, mostly for gold, of which little has been found. In 1900 the Great Rambler mine, opened and abandoned as a gold property, was relocated for copper, and begun shipping ore at once. An interesting feature of this property is the finding of platinum in commercial quantities. The general formation of the Medicine Bow range is a gray and red granite, flanked more or less irregularly by schists and gneisses, with dykes similar to the Encampment district as before described. The Rambler is evidently opened in fissures in the black, dioritic granite, but its upper workings show alteration conditions similar to those prevailing to the westward.

Among the other copper districts of the state is the Laramie Hills, running along the southern state line from Laramie through Albany and Converse counties to Caspar, Natrona county. The formation is a granite core with north and south trend, flanked by schists and succeeding sedimentary formations. Copper is found native in red disintegrated granite at Sherman Hill, and as sulphide ores in prospects at Hecla, Slate Creek, Cooney Hill and to the northward of Laramie Peak. Copper ores have also been found in the Big Horn Mountains and in the Wind river districts, under conditions resembling those of the Grand Encampment district, though little development has yet been attempted on any discoveries in the two last-named districts.

The copper properties of the Encampment district are obviously of more than average promise, the richness of their ores and the considerable values carried in the precious metals enabling owners to develop properties from shipments secured near surface. The alteration zone is of shallow depth, however, and the ultimate value of the district must be determined by the values secured from the unaltered sulphides, on which little work has yet been done. The oxidized ores, however, will enable many owners to give their mines thorough tests at small cost.

CHAPTER VIII.

COPPER DEPOSITS OF CANADA AND NEWFOUNDLAND.

In this chapter the copper deposits of Canada are treated in detail, by provinces, and for geographical convenience, Newfoundland is added, although Newfoundland has never become a part of the Dominion of Canada.

While the metal has been mined for many years in the eastern provinces of the dominion, the Canadian copper industry was never of importance previous to the exploitation of the great nickel-copper deposits of the Sudbury district, in the middle eighties. Since that time the British Columbian fields have become prominent as producers, and the copper industry of Canada is apparently but in its infancy. The dominion must be included in any list of the principal copper producing countries of the future.

NOVA SCOTIA. Native copper is found in this province in the counties of Annapolis, Cumberland, Digby and elsewhere, while copper ores are noted in the county of Anitgonish, near Sidney, and at New Annan, Cape Breton, Colchester, Cumberland, Pictou and Sidney. The ores are mainly sulphides, and at Briar Island, Digby county, the native copper is found in grains in amygdaloidal trap, under circumstances similar to the occurrence of the native metal in the Lake Superior copper district. The Cape Breton deposits are of chalcopyrite, and carry both gold and silver, the ore having a silicious gangue and traversing diorite and felsite rocks.

Present developments in Nova Scotia are mainly in Cumberland and Cape Breton counties. The old Coxheath mines at Coxheath, Cape Breton county, are being operated, while other mines are being developed at Cape d'Or and Wentworth, in Cumberland county.

NEW BRUNSWICK. Copper ores are found in this province in the counties of Carleton, Charlotte, Gloucester and St. John, and native copper is found in certain of the older sandstones. There has been a renewal of interest in the copper deposits of New Brunswick within the past five years, and mines are now being developed at several points. While no striking successes have been scored as yet, there are several properties with good prospects, and it is hoped that some good mines may result from the work now being done.

QUEBEC. In this province copper ores have been found in the counties of Arthabaska, Bagot, Beauce, Brome, Dorchester, Drummond, Levis, Lotbiniere, Megantic, Missisquoi, Richmond, Sherbrooke, Shefford and Wolfe, and also on the north shore of the Gulf of St. Lawrence in the district of Saguenay. Mines have been opened at various times and points in several of these counties, but the principal development has been at Capelton, in the little county of Sherbrooke, just above the New England border. The ores, like those of Ontario, are mostly chalcopyrite, and invariably so where found in quantities sufficient to justify the opening of mines. The sulphide ores of copper are frequently found in conjunction with pyrite and pyrrhotite, and are sometimes developed in mines first opened for pyrite destined for the manufacture of acids. The principal mines have been opened in limestone, near the point of contact with serpentine and diorite rocks, the limestones being more or less closely associated with slates. The Capelton mines carry 3 to 4 per cent. copper and 3 to 4 ounces of silver per ton. The sulphur from these mines is saved, as far as possible, for the making of acid.

ONTARIO. There are copper ores in this province at many different points, and at some of them large mines are opened, while in others mines are developing, and in still others mining work is confined to the merest prospecting. Ontario is a large province, and has a great diversity of topography and geological conditions, its frontier marching with New York in the east and Minnesota on the west.

Copper is found native at several points, but mainly as sulphide ores, and in the Sudbury district the iron-sulphide ores of copper are highly nickeliferous, so much so that this district furnishes more than half of the nickel supply of the world. As a rule the oxide and carbonate ores of the alteration zone are missing in Ontario, the unaltered iron sulphides, mainly chalcopyrite, with a little bornite, reaching to surface with slight traces of change.

The first copper mining in the province was undertaken at the Bruce mines, on the northern shore of Georgian Bay, in 1846, immediately after the opening of the first Lake Superior native copper mines of Michigan. After many years of idleness these mines are now being reopened. The first really important production of the metal after the suspension of work at Bruce Mines came from the discovery of the nickel-copper ores of Sudbury, in 1883, and their development. The ores of the Sudbury district are nickel-copper-iron sulphides, occurring in a country rock of diorite. Mines have been opened at various points in a district several miles square, in the vicinity of Sudbury and Copper Cliff. This district is a fairly large and increasing producer of copper, but, like all other good districts, has its wild-cats and failures, as well as its bonanzas.

Copper is also found in Lanark county, and in the Nipissing district. In the Parry Sound district there are numerous occurrences of the ore, the mineralized belt being of considerable area. This district is located along Parry Sound, on the east-central part of Georgian Bay. The geology of the district is as yet unsettled by the scientists, considerable differences of opinion existing among the various observers. The prevailing rock-forms of the district are gneisses and schists, and the formation shows marked flexion and faulting. There are numerous small quartz veins and frequent pegmatite dykes of large size and great persistence. The topography is rough and much of the rock is utterly devoid of vegetation or covering of any sort, the bald knobs alternating with marshes and swales in the lower ground. The mineralized zone is apparently about a quarter-mile in width with a generally northeasterly and southwesterly trend, and has been prospected for about twelve miles. The ore occurs as extended and approximately parallel lenses with a general trend in line with the mineral belt, and the ore bodies are frequently capped with gossan. The ore, as a rule, is chalcopyrite, with a little bornite and occasional chalcocite, and is auriferous, gold values running $3 to $10 per ton in many cases. Some of the beds are nickeliferous also, the nickel running as high as 2.5 per cent. in some instances.

The district of Algoma, which is very extensive, has copper deposits at a number of points, of which the principal, judged by past development, is in the Bruce Mines district of Georgian Bay. This field also includes the Rock Lake district, sixteen miles distant, where one large mine has been opened and a number of smaller properties are developing. The ores are chalcopyrite in a gangue of quartz, apparently in true fissure veins giving every evidence of permanency. In the Goulais Bay district, north of Sault Ste. Marie, several promising prospects are in process of development. On the northern mainland of Lake Superior, to the eastward of Michipicoten Island, there are sulphide ores of which little is known, beyond the fact of their existence. On the island itself there are amygdaloid strata carrying native copper, this being the easternmost outlier of the Keweenawan formation of the western half of Lake Superior. Various attempts at opening mines on these beds of native copper have proven unsuccessful. Chalcopyrite, chalcocite and domeykite have also been found on this island, in small quantities.

On the northern shore of Lake Superior, east of Thunder Bay, native copper is found on Battle Island and St. Ignace Island in Nepigon Bay, and at Pointe-aux-Mines. Chalcocite occurs on Spar Island, and chalcocite and malachite are found on Silver Islet. In the Thunder Bay district chalcopyrite occurs at Neebing, and a little development has been made at Black Bay and Shebandowan Lake, on native copper in trappean rocks.

In the Rainy River district sulphide ores have been found at several points.

MANITOBA. The province of Manitoba is an agricultural rather than a mining district, but there is a small area of mineral land along the eastern boundary, near Lake of the Woods. A vein, running 18 to 20 inches wide, occurring as a contact between granite and trap, and traceable for a half-mile, has been slightly prospected at Ingolf station, very near the Ontario boundary. This is a pyrrhotite carrying copper, nickel and traces of gold.

BRITISH COLUMBIA. This Canadian province is a kingdom in both area and resources. Its wealth of timber and mineral has been merely scratched, and the development of the past decade, while very great, both actually and relatively, is but the precursor of a far greater work to be accomplished in the future.

The first mining was on placers, for gold, nearly half a century ago. When the placers were exhausted the mining industry languished until the completion of the Canadian Pacific railroad through to the west coast, when permanent mining began in a small way. The first mines were of gold and silver, lead becoming an important product a little later. When the mines of the Trail creek and Boundary districts were opened, less than ten years ago, it was soon found that many of the mines carried considerable copper values. The bulk of the copper production of British Columbia is secured as a by-product from mines of gold, silver and lead, but several exclusively copper mines have been developed. A peculiarity of British Columbian mines—and by no means a disadvantageous one—is that the gold and silver mines usually carry more or less lead and copper, while the copper mines have appreciable values in gold and silver.

There is more or less copper in practically every mining district into which the province is divided, but the mines of the Boundary, Trail and Coast divisions lead in output. The relative importance of the various districts as producers is shown by the following official table of production of refined copper in 1901.

Districts.	Production in Pounds.
Boundary	14,511,787
Trail (Rossland)	8,333,446
Coast	3,115,872
Nelson	1,599,449
All others	43,192

From the trivial output from the districts lumped together under the caption "all others," it must not be inferred that they are of no importance. Many mines of good promise are found in these districts, but lack of development and adequate transportation lines is responsible for small production.

British Columbia now has a number of smelters, all new and mostly large and modern. Excellent results are being secured at many of these, and Wm. Fleet Robertson, provincial mineralogist, estimates that the cost of smelting copper has been reduced as low as $1.35 to $1.50 per ton of ore. These figures are astounding, and coming from a less eminent and accurate source would be received with suspicion.

NEWFOUNDLAND. There are sulphide ores of copper at many points in this island, and native copper has been found in place in stratified archaic rocks, under conditions resembling those governing in the Lake Superior district, on Odorin Island in Placentia Bay, and elsewhere. One mass of native metal weighing 55 pounds has been found, and the geological horizon of the district in which these occurrences of the native metal are noted is apparently about the same as that of the Keweenawan district of Michigan.

The first mining in Newfoundland was done in 1862, at the Tilt Cove mine, which was reopened in 1887 by the Cape Copper Co., its present owner. There are also other copper mines on the island that have been worked to some little extent, among these being the Little Bay, which has reached a depth of 1,350 feet, the Lady Pond, Betts Cove, York Harbour and others.

CHAPTER IX.

COPPER DEPOSITS OF MEXICO, CENTRAL AMERICA AND THE ANTILLES.

Under the heading of this chapter are grouped the Latin countries and islands of North America. With the exception of Mexico, which is a copper field of the first magnitude, and with the possible exception of Cuba, where there was once a considerable industry in the mining and smelting of copper ores, the developments noted in this chapter are of comparatively little importance.

MEXICO. The Republic of Mexico has made relatively greater strides in copper production during the past five years than any other country in the world. Not only has there been a most remarkable relative gain, but the actual gain in output puts Mexico an exceedingly close second to the United States in point of increase. That Mexico will soon lead Spain, and rank second only to the United States, seems assured. The Boleo has long been an important mine, but the copper production of all other Mexican mines was but 1,200 tons so recently as 1896. Since that time the Greene, Inguaran, Candela, Moctezuma, and other great properties have been developed. Those interested in copper will do well to keep an eye on Mexico for the next few years.

Copper in almost every known form is found in some part of the republic. The ore measures are extensive and include many different types of deposits. Argentiferous copper ores are frequently found in the crystalline slates of the Azoic group, a typical example being the district south of Puebla. Copper accompanied by hematite is noted in cretaceous beds of the Mesozoic, while in the Cenozoic group copper is found in regular veins in hornblendic andesites of the Pliocene system, also in the stratified beds of sedimentary rocks of the upper Miocene and lower Pliocene, the Boleo mine in Lower California being an example.

According to the official figures furnished by the Minister de Fomento, the number of copper mines and cupriferous mines within the boundaries of the republic was as follows on July 30, 1899: Mines of copper only, 221, with an area of 2,184 hectares; of copper and lead, 5 mines, with an area of 31 hectares; copper and gold, 69 mines with 857 hectares; copper and iron, 23 mines with 159 hectares; copper and silver, 192 with 1,637 hectares; copper, silver and gold, 55, with 896 hectares; copper, silver and lead, 12, with 147 hectares. This gives a total of 577 cupriferous mines, and an area of 5,911 hectares, out of a total of 8,970 mines of all classes having an area of 84,557 hectares in the entire republic. Taking into consideration the marvelous development of the three and a half years that have elapsed since the date of these statistics, it seems probable that the number of cupriferous mines in the republic is materially larger, unless the process of consolidation has absorbed more old mines than would offset the new openings. According to the summary of S. Chapman, F. S. S., made from the Mexican government's Boletin de Estadistica Fiscal—date not given—the number of cupriferous mines in the republic is materially greater than the figure first quoted. Chapman's summary gives a total of no less than 839 copper mines of all classes, of which 281 are mines of copper only, the balance producing other minerals as well as copper.

Nearly every state and territory of the republic has copper mines, the roster including the states of Aguascalientes, Chiapas, Chihuahua, Coahuila, Colima, Durango, Guanajuato, Guerrero, Hidalgo, Jalisco, Michoacan, Morelos, Nueva Leon, Oaxaca, Puebla, Queretaro, San Luis Potosi, Sinaloa, Sonora, Tamaulipas, Vera Cruz and Zacatecas, also the territories of Tepic and Baja California, and the Federal District of Mexico. In point of output Sonora easily leads at present, with Lower California a good second. The more important developments in the other states are in Chihuahua, Michoacan, Durango, Coahuila, Guerrero and Zacatecas, though there is considerable activity in many of the other states, capital having been poured into Mexican copper mines by the tens of millions of dollars during the past five years. Under the strong but equable administration of President Diaz, Mexico has undergone a transformation during the past two decades. There are as ample safeguards for life and property as may be found in any part of Europe or the United States. The laws are administered constitutionally, rather than dictatorially, and the president has surrounded himself by statesmen of ability and honesty, under whose fostering care Mexico has become one of the favorite fields of investment for the surplus capital of Europe and America. While many failures have been scored, the percentage of successful mining investments made in this country of late years is unusually high.

Mexico has upwards of 300 smelters of all sorts, mostly very crude, but with a few of the most modern type and of immense size, notable among the latter being the fine plants of the American Smelting and Refining Company at Aguascalientes, Monterey and San Luis Potosi. There are also fine reduction plants at the Boleo, Greene Consolidated, Descubridora and other copper mines of the country.

The Sonoran copper deposits are of the Carboniferous system of the Paleozöic group. The principal districts of northern Sonora are La Cananea and Nacos. These are but a short distance south of the Arizona line, and the geological, geographical and climatological conditions are practically the same as in the Bisbee district of Arizona, or, rather, the Bisbee, Nacos and Cananea fields are one district, divided by the international boundary line, and these fields, considered as one district, have furnished perhaps the most important copper mining developments noted on the globe during the past five years. There are other promising districts in Sonora, where development work is in progress, but they have been overshadowed by the spectacular rise of the Cananea mines.

In Lower California there are some 30 copper mines of all classes, mostly insignificant, but the Boleo, operated by a French company, is a property of the first magnitude. This mine is opened on beds occurring in a formation of Tertiary sandstones, conglomerates and tufas. The cupriferous beds, three in number, of large area, lie upon conglomerates of varying horizons and are overlaid by argillaceous tufas, all traversed by fissures. In the upper bed, above the water level, the ores are disseminated oxidized ores, such as melaconite, cuprite, atacamite, azurite, malachite, crednerite and chrysocolla, all in quantities of commercial importance. In the second ore bed there are peculiar globular concretions of oxide and carbonate ores, called boleos, whence the name of the mine. The third bed, in addition to the oxide, carbonate, silicate and oxy-manganate ores, also carries sulphides, not the ordinary iron-sulphides, but chalcocite and covelline, the richest ores of copper. The ores are disseminated in irregular masses, veinlets and concretions, in a clayey tufa, with a marked tendency toward concentration upon the underlying conglomerates, where the ores occur compact in layers of 6 to 10 inches.

While Michoacan has not yet become a large producer, it has one very large property, the Inguaran, in process of development, and other properties of promise are also undergoing exploitation. The Ario district of Michoacan contains enormous bodies of sulphide ores, occurring quite evenly disseminated in granitic rock. It is obvious that these properties must be worked upon a very large scale to prove profitable, but as the Rothschilds are furnishing the money for the development of the largest mine, the district will receive the benefit of adequate capital in its development.

In the state of Coahuila there are several important mining developments. The same is true of Zacatecas and Durango. The state of Chiapas has some rich gold-copper mines, especially in the neighborhood of Santa Fe and Pichu-Calco. In the state of Guerrero there are good copper ore bodies, and a newly organized American company is preparing to develop mines on a large scale, south of the Balsas river in the districts of Braves and Travares, less than 40 miles from Acapulco, which lies on the Pacific coast. The claims made for this property are simply staggering, and if they did not come from an apparently responsible source, would be laughed at as preposterous.

COSTA RICA. There are outcrops of copper ores at several points in the republic, but no attempt has ever been made at opening mines.

CUBA. Copper ores occur at many points in the eastern part of the republic, and the province of Santiago was the scene of the first copper mining done in the new world. El Cobre mines, situated some thirty miles north of the city of Santiago, in the Sierra Madre mountains, were opened in the Sixteenth century and were worked with more or less regularity until 1834, when the various mines of the district were bought by an English company and consolidated. From thence until 1868 the production averaged one million dollars in annual value. The richest ore was shipped direct to Swansea, while the low-grade ore was discarded and the medium quality reduced to matte for export to the smelters. The mines were opened to the depth of nearly a quarter of a mile and were equipped with excellent machinery and buildings. In the rebellion of 1868 the torch was applied by insurgents and the extensive plant entirely burned, since which time the mines have been idle, although a little copper has been obtained every year by natural cementation. Steps are now being taken for the reopening of these mines, which, in view of their past production and profits, are doubtless worthy of the great cost that their reopening and equipment will entail. There are also promising copper deposits in the province of Pinar del Rio, and elsewhere.

GUATEMALA. Excellent specimens of sulphide copper ores have been found at various points in the republic of Guatemala, but no serious attempts have been made at developing these resources, and I am unable to find trace of anything worthy the name of a copper mine in the country.

HAYTI. Copper exists at several points in Hayti, notably in the Hotte Mountain range in the southern part of the country. Previous mining developments have been of the crudest, but an attempt is now being made, under American management, to open regular mines of copper.

HONDURAS. There is copper ore in nearly every department of the little Central American republic of Honduras, but the development of mineral industries is not equal to the possibilities offered, and the only copper producer worthy of the name is the Eureka mine, in Orica Basin, department of Teguciglapa, where a small production of gold, silver and copper is effected.

JAMAICA. Small copper mines were opened at several places in Jamaica many years ago, but the ore bodies proved meagre, so far as exploited, and the mines, being unprofitable, were soon abandoned. There are indications of copper and other metals at many points on the island.

NICARAGUA. A very limited amount of copper is produced in Nicaragua as a by-product from the smelting of silver ores. There are promising undeveloped copper ores in the department of Nueva Segovia, the development of which is rendered difficult by a mountainous country and poor roads. There are also occurrences of copper ores in the departments of Leon, Jinotega and Matagalpa, and in the district of Prinzapulca.

PORTO RICO. Copper ores occur at several points on this island, but, so far as can be ascertained, no serious attempts have ever been made to develop mines thereon.

SAN SALVADOR. There are deposits of copper ore at several points in the republic of San Salvador, but efforts to secure details regarding them have not been rewarded as yet.

SANTO DOMINGO. There are copper, gold and silver ores in the San Francisco Mountains of the department of San Cristobal, and during the year 1900 concessions were issued to Señor Don Antonia Nascia for copper mining at Barrero, San Cristobal, to Señor Francisco Sezzato for copper mining in the same department, and to Señor Francisco Diaz for copper mining.

CHAPTER X.

COPPER DEPOSITS OF SOUTH AMERICA.

The various copper producing fields of this continent are treated alphabetically, by countries, in the pages of this chapter. The cupriferous measures of South America are of vast extent and great value, though as yet having but comparatively small development, except in Chile.

ARGENTINA. The Cordilleran copper belt that traverses portions of Bolivia, Peru and Chile is also found in the Argentine Republic, on the eastern slope of the Andes, in the departments of Tucuman, Cordoba, San Juan. La Rioja and elsewhere, and several mines, notable among which are the Rosario, Carmelita and Restauradora, have been developed, but have never been extensive producers, owing to the primitive methods used in mining and smelting, and the even more primitive means of transport employed, thirty mules being required to carry a ton of ore from the mines to the smelter. A wire rope tramway discounts mule power for such uses. Under such adverse circumstances it is scarcely surprising that Argentina made only 76 metric tons of copper in 1900.

A recently discovered copper deposit near Los Morteros assays 40 to 50 per cent. copper and is said to be well located for economical operation. The principal copper developments within the limits of the republic have been in the Cerro de Capillitas district, where a mass of fissure veins, forming almost a gigantic stockwerk, occur in granite, gneiss and porphyry, with a capping of trachyte. The ores developed in this district are tenorite, cuprite, malachite and azurite, with some bornite and occasional argentiferous tetrahedrite. It is possible that chalcopyrite will come in at greater depth, but the richer ores in the alteration zone are evidently of considerable depth, and are both auriferous and argentiferous as a rule. An English company now owns a number of the best properties of the Cerro de Capillitas district and can scarcely miss making a rich mine, if the large sums necessary for roads and modern machinery are expended judiciously.

BRAZIL. The existence of native copper and copper ores in Brazil has been known for many years, but until very recently no systematic attempt has been made at mining, and no official records kept of discoveries and operations. In fact, no information whatever has been obtained from any of the government officials, on the subject of copper deposits.

A mass of native copper weighing 2,616 pounds was uncovered many years ago, in the neighborhood of Bahia, and now reposes in the royal museum at Lisbon. Copper ores have been found, from time to time, at various points in Brazil, among the more important localities of occurrence being Ouro Preto, Camaquan, Pelotas and various points in the state of Minas Geraes, which has long been noted for its large and profitable gold production. The only systematic work now under way in the republic is near Lavras, Minas Geraes, where a copper deposit found in the spring of 1901 gave assays running up to 75 per cent. metallic copper. This is owned by a company recently organized in Brussels, and thorough development is promised by the new owners.

BOLIVIA. The Andean copper belt of South America reaches through Argentina, Chile, Peru, and Bolivia, and general geological conditions are much the same in the cupriferous districts of all four countries. The exploitation of Bolivian copper mines has been hampered by lack of cheap and efficient transportation, and highly skilled labor is also hard to get and keep. All of the copper produced in this country is shipped through the Peruvian port of Mollendo.

The principal and at present the only active Bolivian copper mines are in the district of Coro Coro, department of La Paz. In this district there are two dissimilar sedimentary formations, apparently of different geologica periods, similar only in their origin and cupriferous nature. The older and underlying formation, "Las Vetas," is an arenaceous conglomerate with argillaceous tendencies, having a northeasterly trend. Superimposed upon this statum is another conglomerate, "Los Ramos," having a southwesterly trend. The upper conglomerate is much like the lower, but is darker in color and mottled with red and whitish particles of gypsum and other minerals not found in the older stratum. In many respects the La Paz field more closely resembles the Lake Superior copper district than any other. The country rocks are eruptive, mainly dioritic, and the copper is found native, as a rule, and only rarely as ores in quantities of commercial importance. Like the Calumet and Allouez conglomerates of the Lake Superior district, the Bolivian conglomerates carry the native metal in fine nodules, although masses, usually small, but sometimes very large, are occasionally encountered. Another point of resemblance is the occurrence of silver, always native, found associated with the copper, but never alloyed with it.

Next to La Paz, the most promising and farthest advanced district is that of Pacajos, where the output reached 1,000 quintals weekly in June of 1900. The same general conditions of labor and transportation govern in this district as in La Paz.

CHILE. Although Chile led the world in copper production about the beginning of the last quarter of the Nineteenth century, that country has lost ground as a producer, not only relatively, but actually. There is reason to believe, however, that the tide has turned, and the output for 1901 was the largest secured for many years. The secret of the sudden rise of Chile, its arrested progress, decline and final rejuvenation as a copper producer is found in the combination of geological, geographical and metallurgical conditions under which the copper industry had its birth, its period of prosperity, its decline and its renascence. There is copper ore in every province, and in nearly every district of every province of the republic. The ease with which the oxidized surface ores were secured and smelted gave rise to a large industry, but, like a fire of kindling wood, while quick and hot the industry was of short life, because the altered ores gave way at depth to the low-grade iron-sulphides. These are now being mined in increasing quantities, and the Chilean copper industry is more firmly established at present than at the height of its former prosperity, even though the annual production be smaller.

Copper deposits were worked in a limited way before the first white man set foot upon the soil of Chile. Under Spanish dominion a little copper was produced, but the industry did not begin to expand largely until the achievement of independence, about the third decade of the Nineteenth century, after which mining flourished greatly. Until 1842 the high-grade oxide and carbonate ores were smelted in charcoal furnaces, but in that year the first reverberatory furnace was built at Coquimbo, by C. Lambert, and in 1857 the first blast furnace was built by the same man. The period of greatest prosperity of the Chilean copper industry begun about 1850, and continued for nearly thirty years, after which there was a period of twenty years during which the industry lost ground slowly but steadily, this depression being followed by the beginning of better times, just at the close of the century. In 1881 Chile, Spain and the United States, the three greatest producers, made about the same amount of copper each, Chile having a slight lead with a trifle more than 41,000 long tons. From that point the output slowly declined to about 25,000 tons, fifteen years later.

Chile has two parallel copper belts, running nearly due north and south, and approximately one hundred miles apart. The principal development has been made in the western, or coastal belt, because of the greater ease of exploitation and transportation. The country rock of the Chilean cupriferous districts is composed mainly of strata of the Permian system, sandstones predominating. These have been extensively faulted, twisted, broken and upheaved by eruptive diorites. The general geological conditions are much the same as are found in the Mansfeld district of Germany, and in the governments of Perm and Elizabethpol in Russia. The Cordilleran belt, which lies back from the coast some distance in a country about as rugged as can be found anywhere, is so difficult of access, in most cases, that but little mining development has been secured, especially in the case of copper ores, on which the cost of transportation is so great as to preclude operations in any but the most favored districts. The two parallel copper-bearing belts stretch from Argentina on the south, into Peru on the northern boundary.

Summarizing from Prof. Ch. Vattier's excellent little brochure, "Mineria i Metalurjia de Chile," the principal copper-bearing districts of the country, as developed, are as follows, from south to north:

In the provinces of Santiago and Valparaiso is the mineral center of Las Condes, and the rich sulphide mines of Los Elguin, Bronces and Transito, with other centers of activity, as at Naltagua, Los Aguirre, Tiltil and Lampa.

In the province of Aconcagua are the well-known mines of Catemu, with the Melon group and other less-known properties. Lying next north comes the province of Coquimbo, ranking among the most important as a copper producer. The principal mines are in the departments of Combarbala, Illapel and Ovalle, including such first-rate mines as the Panulcillo and others less known. The province of Atacama is at present the greatest copper producer of the country. In the department of Vallenar there are numerous mines, among which are the Camarones and San Antonio. The department of Freirina is the location of the great Carrizal mines, upper and lower, and of other important producers. In the department of Copiapo are such great mines as the Dulcinea, Puquios, Nantojo and Tierra Amarilla. The department of Chañaral is the site of the great mines of the same name. The province of Antofagasta is among the greatest copper centers of the country, and has large and important mines in the departments of Taltal, where the mine Esploradora is located; in the neighborhood of Calama, department of Antofagasta, and in the department of Tocopilla.

The Cerro Blanco district is not on the coastal belt, but is located in the Cordilleran zone, the mines being opened principally in trachyte. These were originally opened for silver, but at the depth of about 600 feet a zone of rich copper-silver ore was encountered, and this, in turn, was succeeded at greater depth by unaltered iron-sulphides of good average values. The deepest mine of the district is the Agua Amarilla, which has reached a depth exceeding 1,500 feet.

Among the discouraging features of the Chilean copper trade, for the past twenty years, have been lack of railroads, inefficient labor, high wages and lessened values of ore bodies in the case of the older and deeper mines. Transportation facilities have been greatly improved during the past decade, the enlightened and progressive government of Chile having fostered railroad building, as well as taking a deep interest in the development of the mineral and other natural resources of the republic. General conditions are improving, slowly but surely, and Chile from now on should show gains in copper production. The resources of the republic in this mineral are scarcely excelled by any country except the United States.

COLOMBIA. While the republic of Colombia is noted for its production of gold and silver, little attention has been paid to mining for other than the precious metals. The existence of copper has long been known, but heretofore no attempts have been made at mining in any but the crudest manner, though small quantities of the rich oxidized ores near surface have been extracted at various points, from time to time.

Copper ores are known to exist in many departments, notable among which are Tolima, Rio Blanca, and Cauca. Among the principal deposits of Cauca are those of San Lorenzo, Yocoto, Coli, Pichinche and Andagueda. The principal mining districts of Colima are those of Anchique, Fiscal and Nacoroco, lying southwest of Natagáima. The International Colonizing

Company, of New York, has extensive concessions in this district, on which good bodies of copper ore have been located.

ECUADOR. While there are no working mines in this republic, the existence of copper ores at various points has long been known. One of the most recent and most important discoveries was made in 1900 in the province of Ahuay, about 35 miles from the coast, where a promising deposit of copper ore was discovered, at an elevation of about one mile above sea-level.

PARAGUAY. There are deposits of copper ore in the northern part of Paraguay, but details regarding the size, richness and probable value of the veins are not obtainable.

PERU. The rapidly growing copper industry of Peru suffered a rude shock in the decline of the metal's market price, and production fell off greatly during 1902. The very extensive operations put under way by the Cerro de Pasco company will result, within the next few years, in giving to Peru the largest and best equipped mining and smelting plant on the South American continent, and the example thus set is quite certain to have a highly beneficial effect on the Peruvian copper industry as a whole.

The Andean copper zone of Argentina, Chile and Bolivia is also found in Peru, and copper mines have been opened at a number of different points. According to the reports of the Minister de Fomento for 1900, there were 104 copper mines, an equal number of cupriferous silver mines and two mines of gold, silver and copper, within the boundaries of the republic. The government now has two surveying parties in the field, especially to delimit the copper-bearing districts, but their work will necessarily require a long time for completion. Mine owners furnish no reports to the government, and authenticated facts regarding the copper measures and copper mines of Peru are difficult to obtain from any source.

Peru was once a considerable producer of copper from various districts, but the industry fell into decay until late in the Nineteenth century,when there was a revival, stimulated by the high price of the metal. A limited amount of copper is produced as a by-product in the smelting of cupriferous silver ores. The principal mines of the republic are found in the four districts of Ica, Yauli, Acari and Cerro de Pasco, with minor properties in the districts of Mollendo, Moquega and Huarochiri.

The Ica district was once worked extensively, but was abandoned in 1892. Its largest mine is the Canza. The ores averaged about 30 per cent. copper, the lower grades being rejected. The drawbacks in this district are lack of water and good roads. The mines of Yauli, including the adjacent district of Morrococha, are located at an elevation of upwards of 13,000 feet above sea level. This field was once a considerable copper producer, but work was stopped for the same reason as in the Ica district. More or less silver is still mined, and some high grade copper ore averaging 26 per cent. in tenor is still being mined. The San Francisco is the principal mine of the Yauli district. The Acari district in the province of Camana has a number of small mines, but there is little activity at present. In the other minor districts conditions are practically the same.

The Cerro de Pasco district has always been the principal field of Peruvian copper production, and with the work now under way by the American company will speedily assume a commanding position, not only in Peru, but in all of South America. This district has been worked in a desultory fashion for 300 years, but serious development along modern lines was begun as recently as 1897. The district occupies a basin in the Cordilleras, at an elevation of 14,000 feet, and is most difficult of access. Unlike the other Peruvian fields, which are arid, there is an excess of water at Cerro de Pasco. The ores that have been worked hitherto have ranged in tenor from 25 to 40 per cent. copper. The lower grade ores, of which there are large bodies, have remained untouched, or were discarded after mining, only the richest ores being able to pay for the heavy costs of refining and transportation. The freight rate, for transportation on the backs of mules and llamas, is $40 per ton between the mines and Oroya, the terminus of the Meiggs railroad running from Callao into the Andes. The difficulty of getting out copper and getting in machinery and supplies, upon the backs of pack-animals, over the roughest of mountain trails, can only be understood by those that have had experience. The Cerro de Pasco company has secured control of the old Meiggs railroad, one of the engineering marvels of the world, and will continue the line to the mines from its present eastern terminus at Oroya. This extension was begun in the spring of 1901, and is proceeding uninterruptedly and successfully, though the problems to be met and overcome are certainly among the most stupendous ever attacked by courageous engineers. The expenditures of the company on the mines and railroad are already estimated at seven millions of dollars, and millions more must be devoted to the completion of the work. Fortunately there is no question of the ability of the company to raise any amount necessary.

URUGUAY. There is copper ore in Uruguay, but, so far as can be ascertained, there are no copper mines, and no serious attempt has ever been made at exploiting the copper deposits.

VENEZUELA. This country was once a considerable producer of copper, and is estimated to have made about 65,000 long tons of refined metal in the period 1872-1894, in which latter year the mines of the Aroa or Quebrada district were closed down. The principal cupriferous district of Venezuela is found on the Narvaez or Bolivar tract, between the Tocuyo river on the north and the Yaracuay on the south. This tract extends some 54 miles in an approximately east and west direction, comprising 1,150 square miles. These lands were granted to one Narvaez by the Spanish crown, in 1598, and in 1802 passed, by marriage, into the hands of Simon Bolivar, the liberator. This tract, on which a number of mines were opened, is now owned by a London syndicate. The mines of the Quebrada district, lying on the Aroa river, are included in the lands of this extensive estate. The igneous country rocks are of slate and limestone, with various intrusive rocks. Copper is found in lenticular masses, frequently of considerable size and unknown depth, the series of lenses having a strike nearly north and south. The ores are oxides and carbonates at and near surface, followed at slight depth by iron sulphides.

There are traditions that these mines were worked by the Indians before the coming of the Spanish. Early in the Nineteenth century, a Baltimore company operated several of the mines, and secured about 43,000 tons of high-grade carbonate and oxide ores. Later on Venezuelan capitalists took the mines and removed about 100,000 tons of high and medium grade ores. The Quebrada district will doubtless be given attention at some future time, but just at present political conditions in Venezuela are not satisfactory, and the enlistment of foreign capital, absolutely necessary for the development of the mines, is rendered difficult by the complaints of ill-treatment made by European and American moneyed men who have invested large sums in various mining and land enterprises in this republic.

CHAPTER XI.

COPPER DEPOSITS OF EUROPE.

Brief descriptions of the principal copper measures and developments of Europe are given, under the names of the respective countries possessing cupriferous deposits and mines, in this chapter, the titles being arranged alphabetically.

AUSTRIA. The total annual production of refined copper by Austria is about 2,000,000 pounds. Copper has been mined and smelted for hundreds of years, but none of the mines now active are worked on a large scale, and the mining and metallurgical plants are by no means modern in design.

Copper deposits are found in various parts of the empire, and mines are worked in a small way at several points, the principal of which is Kitzbuehel, in the Tyrol. There are other Tyrolean mines, all of quite insignificant production, and a few small producers at Salzburg. The Graslitz mine, in Bohemia, was a very large producer during the middle ages, but was abandoned in the Eighteenth century.

BOSNIA. Copper ores are mined in a small way at several points in Bosnia. Ore is mined and smelted at Sinjako, while the ores from other points are sent, in limited quantities, to Hungary for reduction. Bosnia and Herzegovina, which are under the protection of Austria, are usually lumped with the dual monarchy of Austria-Hungary in figures of production. The output for 1901 was 237 tons of refined copper, made from 4,747 tons of ore, of which 1,040 tons were fahlerz.

BULGARIA. There is ample evidence that mines of copper were worked within the present limits of Bulgaria during the days of Roman dominion, and possibly in even earlier times. At Plakalnitza, in the department of Vratza, there are considerable slag-piles from ancient smelters, dating from a time so remote that no vestiges of the works themselves are to be found, and in other departments of the principality there are similar but smaller slag-piles and waste-burrows of refuse containing traces of lean ore, the values of which have been effectually leached out by the rains of two thousand years.

At Plakalnitza the ore is mainly bornite, with a little malachite and chalcopyrite. At Kara Bair, near the port of Bourgos on the Black Sea, chalcopyrite is found in considerable profusion, and copper mines were evidently worked there at some remote period. At Milkiovtzy in the district of Trn, there are small deposits of chalcopyrite, chalcocite and malachite, in a barytic gangue. There is also chalcopyrite at Belogradchik, where some work is now being done. Chalcocite is found at Gornya-Banya and at other points in the department of Sofia, not far from the capital city, and in the districts of Sleven and Samokof native copper and oxide ores have been found.

CORSICA. There are a number of old copper mines in Corsica, of which one, the Lancone, was once a considerable producer.

CYPRUS. The Latin word cuprum, from which comes the English word copper, was derived from the name of this island, thus attesting its ancience as a source of copper. In ages long past there were extensive copper mines on the island, but the production at the present time is trivial, exports for 1899, the largest for some years, having been but 36 metric tons. One English corporation is now operating on the island.

ENGLAND. Copper and tin have been mined in Cornwall and Devon from very remote times, possibly for three thousand years. Oxide and carbonate ores occur in the conglomerates and sandstones of Cheshire, and these were once mined to some extent. Cumberland also had copper mines some centuries ago, and the Goldscope was England's most famous copper mine during the Tudor era, working a fabulously large force of men to get the very moderate amount of copper that was secured. During the first half of the Nineteenth century Cornwall and Devon were the world's largest producers of copper. The importance of England, as a source of copper supply, received a check from the development of the richer ores of Chile, and when Lake Superior, South Africa and Australia entered the field of production, the English output began to decline, until it now averages only about a million pounds yearly.

The copper ores of Cornwall and Devon, adjoining counties in the southwestern part of the island, are found in a clay-slate of the Devonian system having frequent bosses and veins of granite, with both slate and granite intruded by a quartz-porphyry. The veins are narrow, three feet being a liberal average, and are frequently capped with gossan, this capping being more common over the copper veins than above the veins carrying tin stuff. Veins of copper seem to favor the slates, while tin takes more kindly to the granite, but these observations hold true in a general way only, as there are many exceptions to the rule, while tin is frequent in copper mines, and copper is of common occurrence in the tin mines, and in places tin and copper alternate in occurrence. As a rule the richest portions of a mine are found where the veins have the sharpest dip. Native copper, while rarely found in quantities of commercial importance, is by no means uncommon, and is found in serpentine at the Lizard. One mass of native copper weighing three tons was secured from a mine near Mullion, Cornwall. The ores of copper are of many varieties, most of the more common sorts occurring, while many of the rarer copper minerals have been found, from time to time, in these two counties.

FAROE ISLANDS. Native copper, associated with mesotype, occurs disseminated in amygdaloid rock in these islands, but no attempt at mining has ever been made, so far as known.

FINLAND. Copper ore is found at several points in Finland, but the only active mines in the grand duchy are at Pitkaranta, where chalcopyrite in sahlite occurs in a granite country rock. These mines have been worked for many years and produce about one million pounds of refined copper annually.

FRANCE. The wealth of France is in her fertile soil, and not in her minerals. Copper ores are found at various points and a number of mines have been opened, but none of them ever proved either large or very profitable, and at present the production of copper from French mines is insignificant, having amounted to only 201 metric tons for the year 1900, the latest figures obtainable from the government bureau of mines. There are copper mines in the department of Var, Gard and Corse, also in Savoy and in the Basse-Pyrenees near the Spanish frontier. Argentiferous copper ore to the extent of 1,184 tons was exported to England in 1900 from the department of Ariege. In the same year 837 tons of iron-copper pyrites were exported to the same country, from the department of Corse, and 115 tons of copper ore were mined in the department of Gard.

GERMANY. The copper mines of Germany rank second in importance in Europe only to those of Spain and Portugal. The industry is one of considerable antiquity, and the history of the Mansfeld mines can readily be traced back to A. D. 1199, in which year the first copper was mined. The Mansfeld district, near Eisleben, in the Southern Hartz mountains, is much the most important in the empire. In this district the ore is found in beds of the Permian system, resting unconformably on crystallized strata of Paleozoic rocks. The eldest of the Permian rocks is a sandstone of several hundred feet in thickness, superimposed upon which is a second sandstone of little depth, upon which, in turn, rests the celebrated "kupferschiefer," or copper-bearing shale, a clayey slate averaging but two or three feet in thickness, and carrying a disseminated sulphide ore returning an average of about 2.5 per cent. metallic copper. The upper sandstone lying next below the kupferschiefer is also copper-bearing to some extent, and is worked at times. The area of the kupferschiefer is very great, probably nearly 200 square miles, and a number of square miles have been worked out and many miles worked over in the seven hundred years that the mines have been in operation. The Mansfeld district is notable for the possession of coal for fuel and limestone for fluxing, in the rocks above the copper-bearing strata, and ore, fuel and flux are sometimes mined from the same shaft.

There are also copper-bearing measures of lesser importance at Goslar, in Prussian Saxony; at Rammelsberg, in Nassau, and still less important ore bodies at several other points in the empire.

HERZEGOVINA. The industrial statistics of this semi-independent little country are usually included with those of Bosnia in the figures of the dual monarchy of Austria-Hungary, as Bosnia and Herzegovina are under the protection of Austria, since the congress of Berlin in 1878. The joint production of copper by Bosnia and Herzegovina reached 237 tons in 1901. Operations are carried on in a most primitive manner, at the few points where any copper mining is done.

HUNGARY. The kingdom of Hungary has about a dozen copper smelters, all small and none modern in design or practice. Copper is mined at a number of different points, the sulphide ores predominating, and the industry is one of great antiquity in this country, but has made comparatively little progress of late, the production remaining practically stationary. The principal mines are in the vicinity of Rezbanya and Dognacska, though even the largest mines are not big producers, and there are a number of small properties from which a few hundred tons of ore are extracted annually.

IRELAND. The copper production of Ireland is insignificant at present, averaging possibly 20 tons yearly, and is secured by cementation from the waters leaching from old mine openings. There are three copper districts in the island, these being the Wicklow, Waterford and Cork and Kerry fields. In the Avoca valley of Wicklow sulphide ores occur in clay slates, much as in Cornwall and Devon. The industry was once important and in 1799 the Conncree mines yielded 677 tons of refined copper, which was a big product for those days. The 1899 production was 17 tons, obtained by leaching and cementation.

In the vicinity of Knockmahon, in County Waterford, the ores are also sulphides in clay slates, and averaged about 10 per cent. copper when worked. In 1843 the output of finished copper was upwards of 900 tons. In the southern part of Cork and Kerry large mines were opened during the Eighteenth and early Nineteenth centuries, the Mountain and Keallonge mines each being more than a quarter mile in depth, while there were other considerable properties at Berehaven and Lackamore, and on Ross island. All these have been idle for some years.

ITALY. Copper was mined in Italy previous to the Christian era by the Romans, and before their day the metal had been extracted by the Etruscans. The industry has had its ebb and flow, but has never been entirely at a standstill, for more than two thousand years. There are a few mines with fairly modern equipments, but as a rule the properties are worked upon a somewhat narrow scale.

The principal copper districts of Italy are four in number, viz.: Volterrano, Grosseto, Liguria and the western Alpine region. The ores of the Volterrano district, mainly chalcopyrite, with a little chalcocite, are found in a red gabbro known locally as porfido rosso. This district has been the scene of copper mining operations from the earliest times of which authenticated records remain.

The Grosseto district is now producing considerable copper from ores occurring both as contact and fissure veins. The Val Castruccio, Bocchegiano, Montecatini and Capanne Vecchie are the principal mines of this district, and the principal mining center is Massa Maritima, the Massa Metallifera of Roman days.

The Ligurian mines lie near the coast of the Mediterranean, above Genoa. The copper ores are found in stratified azoic rocks, as contact veins lying between the diorite or serpentine and the metamorphic rocks, the gangue of the sulphide ores being quartzite.

In the Piedmont district mines were worked in Roman days, and traces of old workings are to be seen at many points. The ores occur in stratified archaic rocks, no fissure veins being found, and nickel and cobalt are frequently associated with the copper, the Calcante being a typical example of the copper-nickel mines of the district. A little native copper is found in some of the Italian mines. In 1900 there were 16 productive mines in the kingdom.

NORWAY. There are considerable deposits of copper ore in Norway, the principal district being near Trondhjem, where the sulphide ores lie in schists and slates of the lower Silurian system. Ores are also found in Telemarken in a granitic country rock, and copper ore is mined to a greater or less extent in the amts of Trondhjem, Stavanager, Nordland and Finmarken, the principal mines being in the Sulitjelma and Roros districts and in Stavanager and Tromsoe. A number of Norwegian copper mines lie to the northward of the Arctic circle. The production of copper from the mines of this kingdom is slowly increasing.

PORTUGAL. Much of what appears under the title of Spain applies to the copper deposits of Portugal as well, and to save needless repetition the reader is referred to the article on Spanish copper deposits in this chapter, for a general description of the cupriferous measures of the Sierra Morena, of which the mines of San Domingos and Grandola, in Portugal, form the western extension. The principal mining fields are the San Domingos, Grandola and Aljustral districts, with lesser properties developed in the Algarve and Aveiro districts. The San Domingos is much the most important mine of the kingdom.

Owing to the close propinquity of the Spanish and Portuguese copper districts, and the operation of mines in both kingdoms by the same English companies, the outputs of both countries are usually lumped in statistics of production. The Portuguese production in 1901 was equivalent to 9,933 metric tons.

ROUMANIA. There are copper deposits, apparently of importance, in this country. In the Carpathian Mountains chalcopyrite and carbonate ores are found at Valea Choboroasa, these assaying 7 per cent. cupric oxide, with a little gold. Samples of ore from Salishtea gave 18 to 32 per cent. cupric oxide and 100 grams gold per ton. Carbonate ores have been found in promising quantities in the district of Dobroudja, at the towns of Balabancea, Islam-Geafer, Carapelit and at Altan-Tepe near Tcheamourli.

RUSSIA. There are extensive copper-bearing measures in the empire of Russia, those of Siberia being separately treated in the chapter on Asiatic copper deposits. As a rule the copper is found in rocks of the Permian system, the name of which was taken from the heavy outcrops found in the government of Perm, where many of the principal Russian copper mines are located.

The principal mines of European Russia are in the governments of Perm, Elizabethpol, Orenburg, Kutais, Tiflis, Nijni Tagilsk and Viatka. Two of the three principal copper producing properties of the empire are in the government of Perm, and these make more than one-half of the Russian production. The Bogoslovski works turned out 72,961 poods of finished copper and the Rudianski works made 86,473 poods, in 1900. The Kargalinski works, in the government of Orenburg, made 18,849 poods in the same year. The governments of Perm and Orenburg are in the Ural Mountain region.

In the Caucasus region are the mines of the governments of Tiflis and Kutais. The largest producer is the Dzansulski, in the government of Kutais, with an output of about 14,000 poods. The Merisski works, in the same government, made 4,544 poods in 1900, and the Alverdski and Shamblurgski works in the government of Tiflis produced 4,490 poods in 1900. The production of refined copper by the mines of the entire Russian empire, including Siberia and Finland, amounted to 7,534 metric tons, in 1899, the latest year for which official figures are available.

There are a number of old mines in the empire, of little productive importance at present, such as the Miednoroudiansk, in the government of Nijni Tagilsk, famous for its massive malachite, a single mass weighing 330 tons having been taken from this mine in 1836. The Kiadebek, or Kadabenski mine, in the Elizabethpol district, is operated by German capital, and is one of the most important mines of the empire, though no figures of production, other than mere estimates, are available for present use.

There are about thirty smelting plants for copper operated in the empire, including those in Siberia. Most of these are small and antiquated, though there are a few that are fairly modern. Judging from the immense extent of the copper-bearing measures, and the good grades of ore secured in the better mines, there is a future ahead of the Russian copper industry, much brighter than might be inferred from the limited development secured in the centuries that have elapsed since copper was first mined and smelted.

SCOTLAND. There are deposits of chalcopyrite in Perthshire, Kirkcudbrightshire, and at several other points in Scotland, but no copper mining is done.

SERVIA. Copper mines have been operated, on a limited scale for many centuries in Servia. There are old mines and a few active properties at a number of points, but the principal copper producers are in the vicinity of Majdanpec. The production of refined copper from Servian mines was 270 metric tons in 1900.

SPAIN. The kingdom of Spain possesses great mineral wealth, and in the value of its copper and iron measures leads all the other countries of Europe. Copper ores are found in Huelva, Alicante, Almeria, Asturias, Badajos, Barcelona, Burgos, Caceres, Castellon, Coruña, Cuenca, Gerona, Granada, Guadalajara, Huesca, Jaen, Leon, Lerida, Logrono, Madrid, Malaga, Minorca, Navarra, Palencia, Santander, Segovia, Sevilla, Taragona, and Teruel, and in all of these copper mines have been opened. Mining is being done at present in a number of these provinces, but the preponderating production of the kingdom comes from the mines of Huelva. This district is in the Sierra Morena of the province of Huelva in southwestern Spain, and the cupriferous formation continues into the adjoining kingdom of Portugal. This district is said to be some 30 miles wide by 150 in length, extending from Aznalcollar in Sevilla to San Domingos in Portugal, but the limits of the demonstratedly profitable zone are much more circumscribed. The Sierra Morena, or Andevallo cupriferous belt as a whole, is divided into four zones. The eastern zone includes the Cerro Muriano and other mines near Sevilla, while the western zone is in Portugal, with the village of Grandola as an approximate center. The northern zone includes the principal mines of both Spain and Portugal, while the leading mines of the southern zone are the Tharsis, Castillo del Buitron, Lagunazo and Las Herrerias. All of these zones present the same general characteristics, having lenticular masses of ore that parallel the layers of slate and the strike of the veins in the porphyry. The ore bodies are of varying size, sometimes of immense dimensions, the largest reaching a length of nearly 4,000 feet and an extreme width of 500 feet. These lenses are usually found at the junction of slate and porphyry. The slates are of the Paleozoic group and probably of the lower Carboniferous system. Their strike is northwesterly, and dip to the north. These slates are of a yellowish tinge at surface, where weathered, but bluish at a little depth. The slates have been intruded by porphyry, syenite and diabase, the porphyries occurring in a succession of parallel lenses with the same strike as the slates. The ore bodies are also parallel with the slates and porphyries, and may be considered true contact veins.

The ore bodies, below the shallow alteration zone at surface, are formed of an intimate mixture of chalcopyrite and pyrite, giving a disseminated sulphide ore of copper averaging 3 to 4 per cent. metal, though considerable ore of higher grade is encountered. The ores are slightly argentiferous and auriferous, and under the highly perfected processes of extraction now employed, the values of the precious metals are quite closely extracted, and small as is their percentage this saving amounts in the aggregate to large sums, owing to the immense tonnage of ore treated annually. A strong tendency is noticed in the lower levels opened in these immense lenses toward decreased dimensions and lessened values.

References to the interesting metallurgical processes employed in the Hispano-Portuguese mines will be found in the chapter on metallurgy, and more detailed references to the geology of the various important mines will be found in the descriptions of the principal mines of Spain and Portugal.

The first copper mining in the Iberian peninsula was done, in all likelihood, by the Phœnicians, some 3,000 years ago, and was continued by the Carthaginians. The Romans succeeded to the dominion of the peninsula, and extensive traces of their work are yet to be found in the Sierra Morena.

Mine timbers, which in all likelihood were put in by Roman workmen nearly or quite two thousand years ago, are still in place, effectually protected from the gnawing tooth of time by the preservative action of the copper sulphate with which the mine waters are liberally charged. The modern era of Spanish copper production dates from 1860, when the Tharsis mine—the Tharsish of the ancients—was reopened. The Rio Tinto was reopened as recently as 1876.

SWEDEN. Copper has been mined in Sweden for more than 600 years, from the famous mines of Falun. The ore at this point is chalcopyrite occurring in connection with iron pyrites, and is found in lenses of considerable size. The Storra Kopparberg mine, near Falun, is the best-known property of the district, and furnishes much of the copper, some of the silver and most of the gold produced in the kingdom. Copper ores are found in the läns of Ostergotland, Malmohus, Orebro, Vestmanland and Kopparberg. There are mines in all of these districts, most of which are small producers or entirely idle. There are three smelters in Sweden, of which the most important is at Atvidaberg. In addition to the metal produced from direct smelting, a little copper is produced at Helsingborg by superphosphate works which extract the copper from the cupriferous iron pyrites residues, producing about 120 tons of cement copper annually. About 550 tons of blister copper is turned out from the smelters at Atvidaberg, Falun and Kafvelstorp, the copper production of the kingdom being insufficient to supply the domestic demand.

TURKEY. Extensive copper deposits exist at several points in the Balkans, on both the Bulgarian and Turkish sides of the mountains. The present copper production of Turkey is probably 3,000 to 4,000 metric tons yearly, of which amount the exports are about 2,500 tons, but these figures are estimates, except in the case of exports. Of exports of approximately 2,400 metric tons made in 1900, the mines and smelters of Arghana Maden sent about 1,400 tons, while about 1,000 tons came from Bakir Maden, near Diarbekir, Asiatic Turkey. The mines at Tokat were once considerable producers, but have fallen off latterly. Copper has been mined and smelted for some centuries near Kharput, and has been produced to a considerable extent by the mines of Kalabak, near Mount Ida, from time immemorial, having been ancient in the time of Strabo, who describes them. The ore at this point is chalcopyrite occurring in slates and limestones said to be of the Tertiary period.

WALES. The copper mines of Anglesea were worked by the Romans, and possibly by the Phœnicians before them. There were also considerable mines in Merionethshire, and up to about 1830 Wales was a considerable producer. At present the only copper production is a score or two tons produced yearly as cement copper from the water leaching out of the old Parys and Mona mines.

CHAPTER XII.

COPPER DEPOSITS OF AFRICA.

There are important developments in copper mining at several African points, and it is probable that the Dark Continent will become a much larger producer in the future than it ever has been in the past. The deposits and developments of this continent are treated alphabetically.

ABYSSINIA. The mineral wealth of Abyssinia is largely a matter of conjecture, but it is certain that copper exists at various points. The Negus Menelik, emperor of Abyssinia, has evidenced progressive tendencies since the Italian invasion of his country was repulsed and has encouraged foreign capital. It has been stated in press dispatches, published late in 1902, that mining and railroad concessions are being revoked, but the news has not been confirmed. Abyssinia is a mountainous country, lacking railroads or good wagon roads, and the development of copper mines is apt to await the securing of better transportation facilities.

ALGERIA. Chalcopyrite and antimonial gray copper ore (tetrahedrite) are the principal copper ores of Algeria. The gray copper found in Kabylia is somewhat argentiferous, and occurs in rocks of Jurassic age. The Aïn Barbar mine, in the department of Constantine, near the Tunisian frontier, has a rather remarkable lense of sulphide ore averaging 8 to 15 per cent. copper, absolutely isolated and enclosed in Ligurian schists. The copper is associated with galena and zinc blende. Along the Mediterranean coast, in the department of Constantine, there are a number of small veins, of no great depth, carrying sulphide ores, in a gangue of quartz. There are several mines of antimonial ores carrying more or less silver in the department of Alger, but none of them are worked at present.

ANGOLA. The existence of sulphide and carbonate ores, in considerable abundance, is reported from various points in Angola, but, so far as known, none of them have been opened, and no attempts at development are contemplated at present.

ASHANTI. The occurrence of native copper, apparently in dendritic forms, in the country several days' journey back from the Ivory Coast of Ashanti, is reported to me by Mr. John Nolan, of Sekondi, Ashanti, who is in charge of diamond drill explorations for gold, conducted by sundry English corporations.

BASUTOLAND. According to Sir Godfrey Lagden there are indications of copper, tin and iron in Basutoland.

CAPE COLONY. The copper production of Cope Colony comes exclusively from Namaqualand, on the west coast, the productive area lying in Little Namaqualand, about 90 miles from the Atlantic. All copper ore shipments are made through Port Nolloth, which ranks fourth in exports in this colony. There are two large companies operating in this district, and the first production was secured in 1852, since which time copper has been exported to the value of nearly $60,000,000.

The ore is chiefly chalcopyrite, returning an average of 17 to 19 per cent. in smelting, these figures making it evident that considerable care is exercised in selection. The country rock is granitic, and the ore occurs in lenses, often of great size. The largest mine is the Ookiep, which is partly exhausted. Little Namaqualand has apparently been a decadent district for some years, but recent explorations have shown promising deposits for future exploitation. It is now purposed building a new railroad, which should prove a considerable stimulus to the development of new mines.

CONGO FREE STATE. The existence of copper ore deposits, some of which are apparently of workable size and richness, has been known for years, but no mining worthy of the name has ever been done. The natives of the upper Congo dig a little iron and copper ore and smelt them with charcoal in pits, for the making of weapons and utensils. At Katanga there are several workable deposits, the ore occurring as lenses in schistose sandstones. At Mboko-Songo a few small mines have been opened in limestone. Ore has also been found in Yambingo, at Manyanga, and near the western shore of Lake Albert Nyanza.

FRENCH CONGO. Copper ore exists at several points in this colony and at least one mine is now in process of development, in the vicinity of Brazzaville.

GERMAN EAST AFRICA. The existence of copper in this protectorate has been reported, from time to time, but, so far as can be ascertained, no efforts have ever been made to develop regular mines on any of the deposits located.

GERMAN SOUTHWEST AFRICA. Copper ore has been found in this protectorate between the Swakab and Knisib rivers, and a mine is being developed at Windhoek by the Damaraland Copper Syndicate, Ltd.

GERMAN WEST AFRICA. It is reported to the German Colonial office that ores of copper, gold, silver and lead have been found in abundance at a spot about 400 miles inland from Walfisch Bay.

GOLD COAST OF AFRICA. The ores of a variety of valuable metals, including those of copper, have been found at various points in the interior of the Gold Coast of West Africa, but no attempt has been made at developing copper mines.

MADAGASCAR. Very little has been done as yet, either by the French government or private capital, for the development of the copper resources of the great African island of Madagascar, although the copper measures already known would seem to warrant exploitation, or, at least, careful government inspection by trained scientists. There are native mines, worked in a crude way by the Hovas, at Ambataofaugehana in the district of Ambositra and at Vohinana. In this district there are two mountain caps, between which are extensive mica-schists of several miles in length. The ore is principally malachite, averaging 10 to 45 per cent. copper, and has sometimes been found carrying higher percentages. These mines are apparently about worked out. Other native mines are reported from the Betafo country. In this district of Imerinarive in the Cercle de Tsiafahy native copper has been found. The metal has also been found in virgin form in the district of Vonizongo. The country about Lake Kinkony in the Cercle of Mahavavy has long been reported rich in copper. According to some rather indefinite reports traces of copper have been discovered recently in the province of Vohemar.

MOROCCO. Though only three hours from Europe, Morocco is almost as effectively closed to civilization as though it were in the center of the Dark Continent. The country is reported to be rich in copper, as well as other minerals, but the sciences of statistics, geology and mineralogy have yet to be discovered in Morocco. Copper ore is found not far from Tangier, and was being mined and smelted, circa 1860, near Tarudant, capital of the province of Sus. This seems the latest authentic information to be had upon the copper deposits and industry of this kingdom.

NATAL. Copper ores exist in this colony, but little has been done in the way of exploration and no mines have been developed. The value of the discoveries made is largely a matter of conjecture.

NYASSALAND. The ores of copper, nickel and zinc have been discovered in Portuguese Nyassaland, but no attempts at mining have yet been made in the case of the copper ores.

RHODESIA. Prospecting for copper has been in progress for several years, and while Rhodesia has not gotten to the productive stage, there are good indications of payable copper mines being secured in the Lomagundi, Umtali and Victoria districts, and development work is now in progress in all of these districts, while copper ores have also been found in the Melsetter district. Several strong British corporations are now at work in different parts of the colony, and thorough tests of the value of Rhodesian copper measures are quite certain to be secured.

Much the most important and most extensive development work is under way in the Victoria district, where copper has been found, apparently in large quantities, near the Kufeke river, a short distance north of the Victoria Falls of the Zambesi river. These falls are of immense height and volume, and are to be harnessed by the South Africa Chartered Company, which has engaged the services of Sir Douglass Fox and Sir Charles Metcalf as expert electrical engineers for devising the works, which, in all likelihood, will be modeled quite closely along the lines of the immense electrical power installation at Niagara Falls. The plans of the company are drawn upon a most ambitious scale, and include the generation of sufficient power to operate not only the mines, but also a railroad line from the falls to the mines, and possibly also a railroad to the coal fields about 150 miles distant.

SENEGAL. Copper ores occur in the vicinity of the Senegal river, but details are lacking.

SUDAN. The only producing copper mine in the Anglo-Egyptian Sudan is the Hofret-el-Nahas, in southwest Kordofan, and this, owing to lack of adequate transportation, is worked solely for local consumption, mining and smelting being upon a primitive scale. Prospecting is now being done in various parts of the Sudan, but no copper has been found as yet, though there is thought to be copper in the Suakin district.

TRANSVAAL. Copper ore was discovered in this colony near Rustenberg, just previous to the outbreak of the Anglo-Boer war. The discovery is said to possess sufficient merit to warrant further attention.

UGANDA PROTECTORATE. Copper is vaguely reported from Uganda, somewhere between Lake Victoria Nyanza and the Nile, but precise information as to these discoveries seems lacking.

ZULULAND. Sulphide and silicate ores of copper have been discovered near the Insuzi and Umhlatuzi rivers, in the Nkandhla district of Zululand. Apparently no attempts have been made to prove the possible value of these ore bodies, which are some distance from transportation lines.

CHAPTER XIII.

COPPER DEPOSITS OF ASIA.

As in the preceding chapters, the copper deposits of Asia are treated alphabetically, by countries.

AFGHANISTAN. The northern part of this country is said by travelers and natives to be rich in copper, Owing to the peculiar political position of the country, which is a buffer state between British and Russian possessions, industrial progress meets with discouraging obstacles. The development of modern copper mines demands railroads, and it is not probable that Great Britain would look with favoring eyes on railroad construction, as such lines would afford an advantage to Russia in case the latter country desired to invade India. The Russians, however, are pushing a transcontinental railway in the direction of northern Afghanistan, and this may lead, when completed, to the development of mineral resources now latent.

ANNAM. There are deposits of copper ore in the province of Quang-Nam, Annam, but detailed information as to the character and extent of the ores has not been secured for the present issue of this work.

ARABIA. There are deposits of copper ore near the shores of the Red Sea in Arabia Petrea, and a number of old mines are found on the slopes of Mt. Sinai. These mines, which yield turquoises as well as ore, were evidently never rich in metal. It is probable that they were the first copper mines ever opened, and the date of the first mining is probably as remote as 5000 B. C. The mines were the property of various nations, from time to time, and were the cause of various wars between the races coveting them, but were held mainly by the Egyptians. It is probable that after being worked for more than three thousand years they were finally abandoned before Moses led the children of Israel out of Egypt. The scepter of Pepi I, a Pharaoh of the Sixth dynasty, now preserved in the British Museum, is made of pure copper, and probably came from the mines of Mt. Sinai. The ore is chyrsocolla in porphyry, and the ruined furnaces and slag piles found near the old adits, still open, show that the ore was smelted at the mines. Analyses of the slags do not show the use of fluxes in the reduction of the ores.

CHINA. Copper is of quite general occurrence in China, but owing to the lack of authentic records accessible to investigators from countries of better industrial development, details regarding many of the provinces are lacking. Copper mines have been worked for many centuries under the most primitive methods of mining and smelting. The production of the empire is estimated at five million pounds annually, all of which is consumed in China.

Among the more important properties are those of the province of Yun-Nan, in southern China, where sulphide veins occur in limestone and sandstone strata near intrusive igneous rocks. The ore is both auriferous and argentiferous. Native metal is also found sparingly, in grains and small masses. The principal production of the empire is from this province, estimated at about 3,000,000 pounds yearly, of which upwards of 2,000,000 pounds are exported to other provinces. Kwei-Chau, also in southern China, produces a limited amount of copper, from ore bodies resembling those of Yun-Nan. There are also a few mines operated in primitive manner, with small production, at San-Kia-Tschang in the province of Ho-Nan, and a little mining is done in the province of Sze-Chuan.

The most modern copper mines and smelters are in Manchuria, and a new and well-equipped reduction plant has recently been completed at Kay-a. With the industrial awakening of China, certain to come during the first quarter of the present century, the mineral resources of this vast empire will receive adequate attention, and while the immediate future holds out no promise of great mines, these will come in time.

COCHIN-CHINA. The existence of copper deposits, apparently of importance, is known in Cochin-China, but no mines are worked.

INDIA. Before the beginning of authenitc history copper was mined and smelted in India, the production being secured along the simplest possible lines of digging and reduction. India was a considerable producer of the metal during the middle ages, and up to the beginning of the Nineteenth century, after which the output fell off slowly. During the Eighteenth century India shipped large quantities of copper to Europe, but the current was reversed later. The last active copper mining upon a considerable scale was done at Baragunda, from 1887 to 1891, but the chalcopyrite ore returned only 1 to 3 per cent. copper, and this was insufficient to permit a profit. A few tons of copper ore are still mined every year, and there are ore measures that will doubtless receive attention at some future time.

JAPAN. According to carefully-kept Japanese annals, copper was discovered about the beginning of the Eighth century. Mining and smelting were of the most primitive sort, the ore being reduced in clay pits, with charcoal for fuel. The first exports, other than to China, were made in the Seventeenth century, when Holland had a monopoly of Japanese trade, and copper was exported annually to the extent of 700 to 1,200 tons for many years.

After the opening of Japanese ports by Commodore Perry, in 1854, the Japanese were quick to realize the advantages of foreign technics and training. All branches of industry have been revolutionized in the past fifty years, and in no trade has greater progress been made than in the mining and smelting of copper. Modern hoists and pumps, air compressors and power-drills, high explosives and other latest aids to mining have been applied, and Japan now has several strictly modern smelters. It must not be inferred that all Japanese copper mines are well equipped and operated in full accordance with the latest practice, for many of the mines are but little improved from the methods in vogue two hundred years ago, but the bulk of the production is secured under advantageous conditions, with excellent machinery, and under the direction of highly-trained engineers and metallurgists. Japanese mining men visit all of the important copper-producing fields of the world, and their practice ranks deservedly high.

Japanese copper ores are almost exclusively sulphides, and there are mines in nearly every province, though half of the 300 copper mines of the empire are idle, and there are but fifty mines or so that make fifty tons or more of refined metal yearly, while the bulk of the Japanese production comes from two groups of mines, the Ashio and the Besshi. Most of the copper ores carry silver, usually in quantities of commercial importance, while several mines have gold-copper ores, the gold values running as high as five ounces per ton in the selected ores of one mine. A little native copper is also found, as well as oxidized ores in limited quantities.

According to the latest available official figures, of date Jan. 1, 1900, the area covered by Japanese copper mines is 54,618,045 tsubo, a tsubo equalling 36 square feet, and mines covering 29,114,697 tsubo, or a little more than half the total area, were in operation. In addition, there were several mines of compound metals, from which a limited amount of copper was secured as a by-product.

The production of refined copper increased from 33,180,250 kin in 1894 to 40,459,709 kin in 1899, a kin being nearly equal to 1⅓ pounds avordupois.

The most prominent figures in the Japanese copper industry are Messrs. Ichibei Furukawa of Tokyo, owner of the Ashio group, and Kichizayemon Sumitomo of Osaka, proprietor of the Besshi mines. Both have done much to modernize copper production in Japan, and to them their country owes a debt of gratitude for the breadth of view that led them, though gentlemen of the old school, to adopt the most modern improvements in their works, thus setting an example of great value as well as providing one of the most valuable exports of the empire.

KOREA. Copper ores are said to abound in this hermit kingdom, but details are scanty. A start has been made at gold mining with modern machinery and methods, and something will doubtless be done later with some of the more promising deposits of copper.

PERSIA. This country has long been known to be rich in copper, and there are mines, so called, in nearly every province, many of them very old. The methods of mining and smelting are of the crudest, and the production is necessarily small, being merely sufficient for the limited demands of the country itself. Until there are better railroad communications and foreign capital can be enlisted in such enterprises but little will be heard from the copper mines of Persia.

SIBERIA. Copper deposits have been located at a number of points in Siberia, and a little mining has been done in several districts. The only mining of any importance now in progress is at Semipalitinsk, where the Pavovski mines and smelters turn out upwards of a million pounds of refined copper annually. The government of Semipalitinsk is rich in mineral resources, including coal and iron, and a large number of copper mining claims were located in 1900 and 1901, on few of which anything of importance has been done. The Akmolinsk district has received some attention from prospectors, and upwards of 100 copper claims have been registered in the Karkaralinsk district. The value of these districts, judged by surface indications, is said to be considerable, but actual mining will be required to determine the true status of the new fields.

TONQUIN. There are copper mines, operated by natives on very crude principles, in the provinces of Sontay, Langson and Laokay, and the ores are said to be of good grade, although the production is necessarily small, owing to lack of modern machinery and methods.

TURKESTAN. There is one small mine, the Karankulski, in the Tashkent district of Turkestan, and there are other unworked ore bodies, some of which are apparently worthy of exploitation.

CHAPTER XIV.

COPPER DEPOSITS OF AUSTRALIA AND OCEANICA.

In this division of the earth the more important copper deposits and mines are developed in the commonwealth of Australasia, though there are beds of copper ore in New Caledonia and elsewhere that give promise of making good mines. The political divisions of Australia, Tasmania and New Zealand are first treated, after which references are made to the other islands in alphabetical order.

AUSTRALIA. The first copper shipment from this island continent was made in 1843, from South Australia, thus antendating the first production of Lake Superior mines by one year. The ores of Australian mines are principally sulphides, though rich carbonates are found at the Blinman mine and elsewhere, while native copper occurs at many points. The copper production of the commonwealth of Australia comes mainly from Tasmania, New South Wales and South Australia following, with 18 or 20 per cent. of the total product each, and Western Australia and Queensland bringing up the rear. More detailed references to the various states of the commonwealth are given under the titles of each, in the following brief articles.

NEW SOUTH WALES. The Great Cobar mine was opened in 1869, and was the first real copper mine of the state, though attempts at copper mining were made as early as 1847. A considerable number of copper mines, mostly shallow and with small development, have been opened at various points, from time to time. The Cobar district, in the western part of the state, is much the most important, and the Great Cobar mine produces the bulk of the copper output. The country rock of this district is mainly slates of the Silurian system, with few eruptive rocks—a rather unusual home for copper. There is also a cupriferous district in the central part of the state, where eruptive rocks predominate, and there are a number of scattering mines along the coast.

QUEENSLAND. This state was at one time a regular copper producer in a small way, but the industry fell upon evil times when the price of copper went down in 1889, after which copper production and development were at a low ebb until about 1898, when there was a great revival. The older copper fields were at Peak Downs, Cloncurry and Mt. Perry. At Peak Downs native copper was mined from amygdaloid trap, under conditions greatly resembling those governing in the Lake Superior copper district. Lack of transportation facilities caused the suspension of work. The Australian

Copper Company was once a considerable producer from the Cloncurry district, but high transportation charges caused the abandonment of that field also.

In the Mt. Perry district there is considerable activity, several strong mining companies being now at work. The Queensland railroad affords good transport, and there are smelters at the mines. The country rock is granite, and the veins are mineralized only for a portion of their width, the rich zones of mineralization rarely averaging a foot in width. Ore values have disappeared with depth in some cases, but in one instance remain unimpaired to a depth of 800 feet. The ores are highly silicious, but it is purposed using the auriferous and argentiferous gossan for a flux, which should kill two birds with one stone.

The Chillagoe district of the Herberton field has ores in carboniferous limestone, the geological conditions being comparable with those of certain Arizona districts. The existence of ore deposits without regular walls, forming a stockwerk, is a typical feature of this district. Development has been hampered by lack of adequate transportation facilities, but this will be remedied by the completion of the Chillagoe railroad, an ambitious undertaking designed to aid in the development of the mineral wealth of a large part of Queensland hitherto inaccessible. A big water power at Barron Falls is available for use at the Chillagoe mines.

There is also considerable activity in the Mt. Garnet district, though something of a chill has been caused by the drop in the price of copper in 1901. A number of small mines have been opened in the Stanthorpe district. These are said to be of promise. Undeveloped copper deposits are also known to exist in the neighborhood of Rockhampton and Gladstone, at Ravenswood, near Cardwell and to the west of Townsville, also, at other points on the eastern watershed.

SOUTH AUSTRALIA. The Kapunda mine was first opened in 1842, a decade before the discovery of gold, and in 1845 the Burra Burra began production. Since that time South Australia has been a regular though not altogether steady producer of copper, and it seems probable that the present annual output of five to six thousand tons is far less than this state is capable of producing. The Moonta was opened in 1863 and later consolidated with the Wallaroo, 10 miles distant. This consolidated property is now the chief producer of South Australia. The first smelter was built at Port Adelaide in 1851, and the second at Wallaroo ten years later.

On the Yorke Peninsula, where the Wallaroo and Moonta mines are opened, the country rock is porphyry, and the ores are principally sulphides, with oxidized ores, including a considerable percentage of atacamite, in the upper parts. A barren zone of 50 to 125 feet lies between the oxidized ores and the unaltered sulphides, though the veins continue regularly, but are filled with gangue rock only.

In the Kapunda district, 50 miles north of Adelaide, where the first mining was done 60 years ago, the ores are oxides and carbonates, with some native copper. In the Burra Burra district, about 100 miles northeast of Adelaide, the country rock is limestone and shale, with very irregular deposits of rich altered ores, more regularity in vein formation being noted at considerable depth. Many mines have been opened in South Australia during the past 60 years, but only a few of them have been developed in more than the most rudimentary manner.

VICTORIA. The existence of copper deposits at various points in Victoria has long been a matter of common knowledge, but for some reason no serious mining has been done. The most notable field is in the Beechworth district, where outcroppings of copper ore have been found at a number of points in an area of about fifty square miles.

WESTERN AUSTRALIA. This state is noted for its large and profitable gold mines, but copper mining is not in a very advanced stage, although the first mine was opened as long ago as 1855. The total production to date is slightly under 15,000 tons, and the current rate of production is less than 1,000 tons per year. The principal development is in the Mt. Malcolm district, where the ore is matted in water-jacket furnaces at the mines. In other districts the ore is hand-dressed for shipment to distant smelters, and of course only the richer altered ores can pay for hand-work and high carriage charges.

Other principal cupriferous districts of Western Australia are the West Pilbarra, Murchison, Northampton, Mt. Margaret, Phillips River, Ashburton and Champion Bay. In the West Pilbarra district the country rock is a schistose slate, the copper occurring in a compact intrusive rock of igneous origin. The ore, chiefly carbonates and oxides of high grade, is secured by quarrying. In the Northampton district, the cupriferous belt is said to reach from the Irvin river on the south to the Murchison river on the north, and to carry rich copper carbonates, as well as lead ores. The Ashburton is a new district, in which a number of leases have been granted, but development work is so slight that little seems known beyond the assured existence of copper ore. The Phillips River district carries silicious gold ores, and ferruginous copper ores, the latter apparently in considerable quantities. The ores are mainly malachite and chalcocite, and are of high value, average assays running 31.48 per cent. copper, 2.16 oz. silver, and 0.15 oz. gold per ton. Taken all in all, it may be said that while Western Australia has been but scratched for copper, the results indicate the existence of several districts of distinctly above the average promise. The drawbacks are scant water supply and lack of railroads, but these can be overcome by a judicious combination of capital, time and skill.

TASMANIA. The copper mining industry of this island has had a rapid growth. The Mt. Lyell mine begun production in 1896, and a large number of new mines were projected in the immediate vicinity. The promoters of these properties displayed a most lamentable paucity of imagination, or else a strong desire to profit by the name of the first successful mine of the district, and as a consequence practically all of the actual and projected copper mines of Tasmania are Lyells of some degree, at least in name.

There is a little native copper in Tasmania, and a limited amount of chalcocite, but the deposits are mainly low-grade chalcopyrite, with a little bornite. The ore bodies occur as mixed iron-copper sulphides, in enormous bodies, in conglomerate and quartzite, the country rock being a micaceous schist. The principal mines are the Mt. Lyell and North Mt. Lyell, two properties that should be one, as each is the natural complement of the other, and both could be best worked as one, the Mt. Lyell ore being low in copper but rich in sulphur, while the North Mt. Lyell ores are of high grade but illy adapted for smelting without a flux of just the sort found in the chalcopyrite of the Mt. Lyell. The Mt. Lyell Blocks is notable for its present attempt to develope a native copper mine, the prospects of which are said to be good.

The Tasmanian copper fields are among the most important opened within the two past decades and give promise of large production in the future. So far development is confined almost exclusively to the Mt. Lyell district, but a little exploring is being done in the Mt. Jukes and Darwin fields. Tasmanian production (exports only) was 11,221 tons of ore and 9,981 tons of blister copper running better than 99 per cent. in the year 1901.

NEW ZEALAND. Copper mines were opened and worked on Great Barrier Island and on Kawau Island, New Zealand, circa 1865, but the mines were closed when the price of copper fell. There has recently been some talk of reopening the Kawau Island mine. A mine was also opened at Nelson, circa 1880, on a sulphide ore vein, by Melbourne people. This mine had a smelter, and it has recently been proposed to reopen the property. Ore has also been found at Omaunu, Whangaro county. A little copper ore is dug and exported every year, the production amounting to but 12 tons of ore in 1900.

BORNEO. The existence of copper, gold, coal and other minerals has been noted in the northern part of the island of Borneo.

JAVA. This island is the source of a small annual supply of copper, obtained under the most unique conditions. In the Gunong Kendeng district there are springs containing iodides in solution, and from these thermal waters crude iodide of copper is secured by evaporation, the production amounting to 2,346 kilograms in 1899. It is probable that deposits of copper ore exist in the interior of the island, but definite data is lacking on this point.

NEW CALEDONIA. Copper has been mined to some extent in the northern part of this island, the ore occurring as chalcopyrite in lenticular masses in talcose and chloritic schists, these being said to contain an average of 16 per cent. copper. Silver is found in association with the copper in most cases, and New Caledonia is, next to Canada, the most important source of nickel supply at the present time.

SOLOMON ISLANDS. Copper ore has been found in the British Protectorate of the Solomon Islands, but details are lacking.

PHILIPPINES. Copper has been mined and smelted in a crude way in these islands since the Eighteenth century. In a typical native reduction plant the ore, after being hand-mined, is cobbed to medium size, then broken to small lumps on anvils, after which it is reduced to still finer size by passing through trains of rolls, usually of iron, but sometimes of stone. The ore is then smelted in crude furnaces and brought to metallic form by successive manipulations. Naturally, the production is small, and is all taken for domestic uses. There are no figures of output available. There are copper and gold mines at Mancayan and Suyoc, province of Lepanto, Island of Luzon, also at other points on this island, the copper ores of Luzon being auriferous as a rule. There are also deposits of copper ore, from which a little metal is extracted occasionally, in the islands of Benguet, Negros, Panay and Mindanao, and also, it is believed, in the little-known island of Sulu.

CHAPTER XV.

COPPER MINES OF THE WORLD.

This chapter, containing nearly three-fourths of the entire work, is devoted to detailed descriptions of the copper mines of the world. It has been thought best, both for economy in space and to facilitate reference, to insert the mine descriptions in alphabetical order, regardless of geographical location, thus rendering this chapter self-indexing. While the plan has some disadvantages, it seems, upon the whole, to offer conveniences that could not be secured by any other arrangement.

The number of mines and companies listed in this edition is nearly 50% greater than last year, and the descriptions are much more complete than formerly.

AAMDAL COPPER MINES SYNDICATE, LTD. **NORWAY.**

Property, the Aamdal mine, at Mo, Bratsbergamt, Norway, sold to Tharsis Sulphur & Copper Co., Ltd.

ABBEY MINING CO. **NEW MEXICO.**

Office: 812 Park Bldg., Pittsburg, Pa. Mine office: Socorro, Socorro Co., N. M. Organized December, 1901, under laws of New Mexico, with capitalization $1,000,000, shares $1 par. Nelson Weddle, Jr., president; Earl A. Wheeler, vice-president; H. A. Spangler, treasurer; F. S. Tewksbury, recording secretary; J. F. Hinckley, financial secretary; Nathan Hall, general manager. Lands, 39 claims, area 780 acres, in five groups. The original group of 12 claims, known as the Abbey, is 22 miles north of Magdalena, Socorro county, showing two parallel veins, with about 600′ of development work, now idle because of heavy inflow of water at depth of 100′, showing ores assaying up to 40% copper and 80 oz. silver per ton. The Washington group of 7 claims, 10 miles west of Upham, has a 165′ shaft. The Lead group of 3 claims shows silver-lead ores. The Manganese group, near Rincon, shows high-grade manganese ores, unavailable for mining until given rail connections now lacking. The Little Baldy group of 6 claims, in the Magdalena mountains, 6 miles from Water Canyon, is the site of the company's present development work, by a 900′ tunnel on a vein of 13′ to 26′ width, paralleled by a quartzite dyke of 400′ to 700′ width giving assays of $3 to $5 gold per ton. Company is officered by men of high personal standing.

BBOT CREEK GOLD & COPPER MINING CO. **NORTH CAROLINA.**

Office: care of W. J. Brent, Portsmouth, Va. Lands are in Lexington county, N. C. Main shaft 80′, in vein giving average assay values of $15 per ton in copper and gold. Has concentrator and mill with Tremain stamps and crusher.

ABERDEEN COPPER CO. **NEW MEXICO.**

Office: 44 New St., New York. Mine office: Lordsburg, Grant Co., N. M. Capitalization $1,000,000, shares $25 par. M. F. Nagle, president; Frank W. Daniell, general manager. Management intended to change title to Aberdeen Consolidated Gold & Copper Co., but came to grief in 1903. New management has arranged to resume work and remodel the plant. Lands, 52 claims, area 1,145 acres, in the Virginia district, showing 10 fissure veins, of which 7, averaging 5′ width, are more or less developed, giving sulphide ores assaying 7% copper, 10 oz. silver and $2 gold per ton, with considerable lead values, and are opened by 8 shafts, with about 3,000′ of underground openings. Has steam power, air compressor and 50-ton concentrator. A small smelter has been built on the company's lands by the National Smelting & Refining Company. Company has paid dividends of $32,175, which had better have been retained in the treasury. Property considered promising if given proper development and careful management.

ACARI COPPER MINING SYNDICATE, LTD. **PERU.**

Did a little mining in the Acari district, province of Camaña, Peru. Mines idle at present.

ACCIDENTAL MINING & MILLING CO. **COLORADO.**

Mine office: Granite, Chaffee Co., Colo. C. Tryon, superintendent. Ores carry gold, silver, lead and copper. Has steam power.

ADA MINE. **MONTANA.**

Mine office: Basin, Jefferson Co., Mont. Timothy Downey, manager. Ores carry gold, silver and copper. Employs 20 men.

ADAKAI MINE. **JAPAN.**

Mine office: Adakai-mura, Yatsuka-gori, Izumo, Japan. Country rocks are Tertiary shale and sandstone, alternating. Principal vein strikes N. N. E. Ores are bornite, chalcopyrite and pyrrhotite, accompanied by native copper and sphalerite, with clay gouge.

ADAMS COPPER CO. **WYOMING.**

Mine office: Saratoga, Carbon Co., Wyo. W. S. Adams, superintendent.

ADAMS COPPER MINING & REDUCTION CO. **COLORADO.**

Office: 513 Cooper Blk., Denver, Colo. Capitalization $800,000, shares $1 par. Lands, 4 claims in Larimer county, Colo. Main shaft, 100′, showing auriferous copper ore.

ADDIE COPPER MINING CO.

Letter to former address, 206 Mining Exchange, Denver, Colo., returned unclaimed.

ADELAIDE STAR MINES, LTD. **NEVADA.**

Offices: 33, Renfield St., Glasgow, Scotland. Mine office: Golconda, nearly 200′ south of the North Butler. Ranges in value from very rich to absolutely worthless, carrying masses to a considerable extent, but in proportion to its great width provides but a small amount of stamp-rock, though fine stopes are occasionally opened, and always has been noted for its richness in silver. This amygdaloid apparently has a felsite base, and chemically and mineralogically is unlike the parallel strata on either side, A large amount of opening work has been done on this lode.

(6.) Ogima. Lies about 100′ south of the Butler, and has been but little opened on the Adventure. Shows some good stamp-rock.

(7.) Evergreen. Lies about 250′ south of the footwall of the Ogima, and averages about 10′ width. Has produced considerable copper at adjoining mines.

The cupriferous lodes of the Evergreen belt are notoriously bunchy, being exceedingly rich in spots and entirely worthless at other points. The strike of the parallel lodes of the Adventure is N. 73° E. on the main tract, where operations are now in progress, and the shafts are sunk at an angle of 45°. There are 4 tunnels and 4 shafts, latter all sunk on the Knowlton lode at 45°, and numbered from west to east. No. 1 is a 3-compartment shaft, 7x18′ inside of timbers and 765′ deep. Surface equipment includes a 38x59′ steel boiler-house with three 500-h. p. Burt boilers; a 59x59′ steel engine-house having an Allis-Chalmers double-cone duplex direct-acting hoist with 24x60″ cylinders, capable of raising a 12-ton load from a depth of 5,000′ on an incline of 45° at a speed of 2,000′ per minute, and a 38x65′ steel compressor-house, with a 60-drill Rand-Corliss air-compressor of high efficiency. No. 1 shaft-house and rock-house are separate buildings, 200′ apart.

No. 2 is a 2-compartment shaft 6x12′ inside of timbers, 490′ deep. The shaft-house is connected with No. 3 rock-house by a 600′ trestle with gravity-tram, also with a railroad siding by a 300′ gravity-tram trestle.

No. 3 is a 3-compartment shaft 7x18′ inside of timbers, 725′ deep. It has a 42x84′ combination steel shaft-rockhouse 116′ high. The 59x59′ engine-house is of wood, with a duplicate of the hoist at No. 1. Mining work is now being concentrated at No. 3, which is to be sunk to a depth of 1,000′ during 1904.

No. 4 is a development shaft with temporary equipment, 2,500′ east of No. 3, and has reached no great depth.

Water for boilers is taken from a stream dammed near No. 1 shaft. The mine has a complete electric light and power plant, and a system of electric haulage in the Butler tunnel. The principal mine buildings are sheathed with steel and painted. The mine location is an exceptionally handsome one, the big mine structures and comfortable houses of employes being set off by natural beauties of topography and forest.

The location is fully protected by water mains, fed by a reservoir on Adventure Bluff, and the mine is served by the Copper Range railroad, a spur of which runs to the mine.

The stampmill is at Edgemere, on Lake Superior, put in commission Sept. 22, 1902. The mill, built and equipped by the Allis-Chalmers company, is 135x217′, of steel on stone foundations with 69x72′ boiler-house and 38x72′ pump-house. Equipment includes 3 Allis-Chalmers heads, fitted with Parnall-Krause mortars having 11-16″ openings in discharge screens, with two horizontal revolving screens having 5-16″ openings for each head. The stamp pistons are automatically rotated, equalizing wear on the shoes. From the revolving screens of the heads the crushed rock goes to the separator jigs, 24 for each head, or 72 to the mill, thence to 36 finisher jigs. There are round slime-tables, 3 Overstrom and 3 Wilfley concentrators and Huntington mills for the raggings. The rock bins have a storage capacity of 4,500 tons. Coal is delivered from trestles to the boiler-rooms by gravity, through chutes. The pump is a 16,000,000-gallon Riedler, drawing its supply from Lake Superior through a tunnel extending 1,200′ under the bed of the lake. Miscellaneous improvements at the millsite include an office, smithy, machine shop, dwellings, etc. There is 8′ to 12′ of clear water offshore, permitting the landing of cargoes from scows, in good weather.

The Adventure has proven a great disappointment to all concerned. The management is facing the responsibility courageously, and doing everything possible to retrieve success from an apparent disaster. Operations have been successively curtailed, until at the close of 1903 but 20 power drills are worked, 14 on stoping, as compared with 41 a year previously. Work is being centered on No. 3 shaft, the most promising opening, which is to be deepened. Forces have been cut to the bone, and every economy is practiced. The mill works two heads day-shifts only, treating a little more than 400 tons daily. A single head, on test, has treated 535 tons in 24 hours. Production for 1902 was 606,211 pounds of refined copper, and for 1903 was approximately 3,000,000 pounds. The Adventure probably paid its way, with perhaps a small profit, during the latter half of 1903. The hope for the future lies mainly in developing richer ground at depth.

ADVENTURERA MINE. **MEXICO.**

Mine office: Sabinal, Chihuahua, Mex. Ore bodies occur irregularly in slate dikes, and carry silver, lead and copper. Mine is opened by shafts, equipped with steam power and employs about 150 men.

AETNA MINE. **MICHIGAN.**

Address: care of W. K. Prudden, Lansing, Mich. In Keweenaw Co., Mich. Produced 70 tons, 881 lbs. refined copper, 1863-1873; since idle.

AETNA GOLD & COPPER MINING CO. **UTAH.**

Mine office: Bingham Canyon, Salt Lake Co., Utah. J. A. Kauffman, superintendent. Has auriferous and argentiferous copper ores, with steam power and employs a small force.

AETNA MINING CO. **COLORADO.**

Said to have a copper-silver property at Bonanza, Saguache Co., Colo. Not found by postal authorities.

AETNA MINING CO. **WYOMING.**

Office: care of R. H. Fehland, Merrill, Wis. Mine office: Riverside, Carbon Co., Wyo. Employs 9 men. Julius Thielman, secretary; Roger

Daniels, superintendent. Organized under laws of Wyoming, with capitalization $1,000,000, shares $1 par. Lands, 7 claims, area 140 acres, in the Upper Platte district, showing 4 veins of 3′ to 6′ width, as fissures and contact veins between granite and quartzite, carrying chalcopyrite, bornite and chalcocite estimated to average 25% copper, and developed by shaft of 117′ and tunnels of 125′ and 380′. Was installing a 40-h. p. steam plant at close of 1903. Property considered promising.

AFORTUNADA COPPER MINES, LTD. **SPAIN.**

Offices: 10, Norfolk St., London, W. C., Eng. Mine office: Figueras, Gerona, Spain. Hon. J. A. de Grey, chairman. Capital nominal, £75,000; debentures, £10,000 authorized, £5,300 issued. Lands, 69 hectareas, area about 175 acres, leased from Spanish government at annual rental of £8 17s. and 2% royalty on gross production.

AFRICAN & AUSTRALIAN CO., LTD. **AUSTRALIA.**

Offices: 257, Winchester House, London, E. C., Eng. J. B. Palmer, chairman; H. J. Dixon, secretary. Is the third reconstruction of the West Australian Mining Co. and Victoria Copper Co., with capitalization £120,000, shares 2s. par. Holds a stock interest in the Copper Selection Syndicate, Ltd.

AFTERTHOUGHT MINING CO. **CALIFORNIA.**

Property sold to Great Western Gold Co.

AFTON MINING & SMELTING CO. **MONTANA.**

Office: Helena, Mont. Idle. Organized 1897, under laws of Washington, with capitalization $60,000, shares $500 par, $70 paid in. T. J. Davies, president; F. M. Dudley, secretary. Lands, 3 claims, area 44 acres, in Colorado Gulch, Lewis & Clarke county, Montana, showing 3 fissure veins, one with an average width of 75′, carrying sulphide ore and small quantities of oxides and carbonates having an estimated average tenor of 2%. Development is by 4 shallow shafts and a 730′ tunnel.

AGASSIZ MINING CO. **ARIZONA.**

Office: 92 State St., Boston, Mass. Letter returned unclaimed from former mine office, Ray, Pinal Co., Ariz. Organized 1900, with capitalization $1,250,000, shares $1 par. Lands, 17 claims, also 40 acres of placer gold property on the Gila River, near Ray. Idle at last accounts.

AGATE HARBOR MINE. **MICHIGAN.**

Address: care of John H. Gatiss, owner, Eagle River, Mich. Has been prospected to some extent, but was never a producer.

AGORDO MINE. **ITALY.**

A small property in the province of Venetia, Italy.

AGUA BLANCA MINE. **MEXICO.**

A partly developed property, about ten hours' ride (horseback) northwest of Autlan, Jalisco, Mexico. Controlled by the Dwight Furness Co.

AGUASCALIENTES METAL CO. **MEXICO.**

Office and mine: Asientos, Aguascalientes, Mex. Employs 300 men. Chas. L. Bennett, president; Kuno Doerr, vice-president; Victor Hunton, secretary; Albert Doerr, general manager. Organized Dec. 31, 1901, under laws of Mexico, with capitalization $35,000, Mexican, shares $500 par. Is operated as a close corporation. Lands, 50 pertenencias, area about 125 acres, in the Asientos and Tepezalá districts, showing 5 ore bodies, of which 3 are being developed, these having average width of 5′ and carrying average values of 5% copper, 8 oz. silver and 0.2 oz. gold per ton, in oxide, carbonate and sulphide ores. The Merced-Orito mine has shafts of 250′ and 300′ and the San Simon y Anexas have a 300′ tunnel. Is installing a 110-h. p. De Laval steam turbine, electric hoist and Cameron electric triplex pump, at the Merced-Orito. The Mexican Central railroad reaches the mines. Output averages 1,000 tons of ore monthly and is sold the Aguascalientes smelter of the American Smelting & Refining Co. Production of refined copper is about 1,000,000 lbs. yearly.

AGUILA MINES. MEXICO.

In the Sierra Ponces, Chihuahua, Mexico. White & Duran, operators. Has argentiferous copper ore.

AHMEEK MINING CO. MICHIGAN.

Office: 199 Washington St., Boston, Mass. Mine office: Kearsarge, Keweenaw Co., Mich. Organized 1880, under laws of Michigan, with capitalization $1,250,000, shares $25 par. A. S. Bigelow, president; W. J. Ladd, secretary and treasurer; Wm. E. Parnall, superintendent. Employs about 60 men. Lands, 920 acres, lying west and south of the Mohawk. Was set off in 1880, by the Seneca company, to work the Kearsarge or Houghton conglomerate, and under the management of Capt. John Daniell sunk 2 shafts in this bed, which averages about 70′ width, with 3 pay-streaks, of 2′ to 3′ width each, aggregating 7′ width, each carrying copper in good quantities, but not payable, owing to great width of partially or wholly barren rock. Resumed work December 2, 1902, and exchanged 11.188 acres with the Allouez in July, 1903, for an equal area, this giving each property a better arrangement of lands for development. The Kearsarge lode was located by diamond drill in the spring of 1903, and immediately opened by a 137′ crosscut sent from the bottom of an old 100′ vertical shaft. The lode was found both wide and strong, carrying a high grade of stamp-rock and heavy copper, fully equal in appearance to almost any other opening on the wonderful Kearsarge lode. The crosscut also showed finely disseminated copper in the footwall for 20′ before reaching the lode. Drifting was begun when the lode was reached and an incline shaft, known as No. 1, was holed through to surface. No. 1 shaft was 130′ and No. 2 shaft 36′ deep at the end of 1903. The machinery plant is all of a temporary nature, but ample for immediate requirements. The rock broken in development work will be stamped at the Tamarack mill, which arrangement will give the Ahmeek company a considerable source of revenue and save the shareholders several dollars per share in the cost of development and equipment. This property is in the hands of a strong and experienced management, and beyond doubt will make one of the great mines of Lake Superior, within the next five years.

COMPAGNIE DE MINES D'AIN-BARBAR. ALGERIA.

Offices: 39, Rue Dulong, Paris, France. Mine is in the department of

Constantine, Algeria, having several veins of chalcopyrite assaying 8% to 15% copper, associated with sphalerite and galena. Idle since 1899.

AJAX GROUP. **BRITISH COLUMBIA.**

On Valdes Island, Nanaimo district, B. C. A prospect from which 30 tons of ore have yielded 25% copper and $6 gold and silver per ton.

AJAX MINE. **MONTANA.**

Mine office: Fox, Beaverhead Co., Mont. Noyes & Morse, owners; W. B. Stanchfield, superintendent. Ores carry gold, silver, lead and copper. Has steam power and a 5-stamp mill.

AJO MINES. **ARIZONA.**

Located in the Ajo basin, Arizona, 120 miles south of Tucson, and 170 miles southeast of Yuma. Thos. Doak & Son, owners. Property includes the Shotwell mine having a 10-stamp mill and 2 Woodbury concentrators. Has rich copper ores and has produced considerable native copper from limited openings. Development hampered by lack of adequate transportation facilities.

AK-SAR-BEN COPPER CO. **WYOMING.**

Mine office: Encampment, Carbon Co., Wyo. A. H. Crow, superintendent. Property has a strong gossan capping of hematite and limonite, with an 80′ shaft which has not yet penetrated the capping sufficiently to reach the copper that undoubtedly exists at greater depth.

ALABASTER CAVE GROUP. **CALIFORNIA.**

Owned by Holmes Lime Co., San Francisco, Cal. Lands, 180 acres, 7 miles east of Newcastle, Placer Co., Cal. Vein traceable 6 miles, with strong gossan outcrop. Ore said to average 4% copper, from pay-streak of 3′ to 8′ in contact vein 12′ to 20′ wide, between limestone and slate.

ALADDIN & CAPE NOME MINES. **MONTANA.**

Mine office: Clinton, Missoula Co., Mont. J. P. Porter, superintendent.

ALAMO COPPER COMPANY. **ARIZONA.**

Said to have copper claims near Ajo, Arizona, but neither claims nor office located.

ALASKA COPPER CO. **CENTRAL ALASKA.**

Near Valdez, Alaska. Letters addressed to this company, care of H. O. Havemeyer, president, have neither been answered nor returned, but Mr. Havemeyer has written Judge Mellen, of the Alaska Copper Company at Coppermount, stating that he knows nothing of this company. Lands are located in the Copper River district, about 150 miles from Valdez, and are known as the Bonanza group. Title was in litigation with the Chittna Exploration Company, case being decided in favor of Alaska Copper Co. District lacks transportation facilities, and mines cannot become important producers until a railroad is built to them.

ALASKA COPPER CO. **PRINCE OF WALES ISLAND, ALASKA.**

Office: 430 Globe Blk., Seattle, Wash. Mine office: Coppermount, Prince of Wales Island, Alaska. Employs a considerable force. Organized 1900, under laws of New Jersey with capitalization $5,000,000, shares $25 par. Henry W. Mellen, president and general manager; Chas. R. Reynolds, vice-president and superintendent; Frank T. Hunter, secretary and purchasing agent; S. B. Agnew, mine superintendent; R. H. Mellen, smelter superintendent; Frank B. Seeley, engineer. Lands, 18 patented claims, area 360 acres, also 18 patented millsites, area 80 acres, giving 1¼ miles frontage on Copper Harbor, a land-locked haven with deep water. Lands are on Copper Mountain, rising to height of 3,600′ directly from the harbor. Property is estimated to carry 20,000,000′ of marketable timber, and has excellent water-power, partially developed by a 22′ steel pipe line of 1,900′ from Reynolds creek to the power plant, where there are 2 water-wheels of 300 h. p., total available power being estimated at 2,800 h. p. Lands show 3 veins, of which the Brooklyn is 10′ to 30′ wide, showing chalcopyrite assaying 3% to 34% copper. The New York vein is a contact between porphyry and limestone, 10′ to 60′ wide and 500 tons of selected ore therefrom gave smelter returns of 16.9% to 29.06% copper, being the richest copper ore ever produced on the Pacific coast. The principal vein is the Indiana, in limestone near a granite intrusion, with extreme width of 280′, showing an average of above 5% copper and $2 gold per ton, with occasional assays running up to 25% copper and $6 gold per ton. Has a 150′ shaft, with tunnels of 200′, 430′ and 500′, showing oxide and carbonate ores, with a little native copper near surface, and sulphides at depth on the New York vein. Mining is planned to be done mainly by tunnel, giving cheap extraction. Surface plant includes hoists, air-compressor and necessary mine buildings and dwellings. Company is said to have contracted for a 200-ton smelter, for which the foundations are up, and plans to eventually increase to 600 tons daily smelting capacity.

This property possesses very large and apparently very rich ore bodies, and has exceptional natural advantages as to location, transportation, power, fuel and timber. It is well managed, by men of excellent standing, and gives promise of making a large and successful mine.

ALASKA INDUSTRIAL CO. ALASKA.

Office: 11 Broadway, New York. Mine office: Coppermount, Prince of Wales Island, Alaska. Employs 26 men. Hon. John P. Jones, president; Wm. Leavitt Haines, secretary; Chas. A. Sulzer, general manager; Wm. H. McVeigh, mine superintendent; Maj. Henry G. Catlin, engineer. Organized [illegible] under laws of New Jersey, with capitalization $1,000,000, shares $1 par; $[illegible],000 unissued. Company has no liabilities. Annual meeting, second Monday in November. Lands, 60 patented claims, area 1,200 acres, also [illegible]-acre millsite, 80-acre townsite and miscellaneous timber lands, giving total landed area of 2,200 acres. Has 7 wide contact veins, between granite and limestone, said to give average assays of 6% copper, 3 oz. silver, traces of lead and $3 gold per ton, from oxide, carbonate and sulphide ores. Has shafts of 25′, 30′ and 60′, with 43 open cuts and 5 tunnels, longest 210′, on the Jumbo group; tunnels of 29′ and 132′ on the Green Monster claims, and 1[illegible]′ tunnel on the Mt. Vesta claim. A water power of about 1,000 h. p. is available for development. Has necessary mine buildings and dwellings, sawmill and a general store, with tidewater at the mine. Company estimates production for 1904 at 100,000 tons of ore, averaging $10 per ton in value, and plans to build a one-mile ground tram and a one-mile aerial tram, develop water power, build wharves, continue underground development and install a 10-drill air-compressor in 1904.

ALASKA MINING CO. **UTAH.**

Mine office: Silver City, Juab Co., Utah.

ALASKA SMELTING & REFINING CO. **ALASKA.**

Office: care of Samuel Silverman, general manager, Spokane, Wash. Mine office: Coppermount, Prince of Wales Island, Alaska. Is an auxiliary corporation of the Brown-Alaska company. Paul Johnson, smelter superintendent. Has ordered a very complete smelting equipment, to be in operation early in 1904, and plans doing a general custom smelting business.

ALBERNI GOLD & COPPER CO., LTD. **BRITISH COLUMBIA.**

Letter returned unclaimed from Alberni, Vancouver Island, B. C. Property is the Thistle group, on Douglass Mountain, showing chalcopyrite assaying up to 1 oz. gold per ton.

ALBION COPPER MINING CO. **MONTANA.**

Mine office: Sunday, Granite Co., Mont., Christian Reichert president; James M. Hinkle, secretary. Lands opened by tunnels show 3 veins, carrying copper, gold, silver and lead ores, which will require concentration.

ALDA COPPER MINES, LTD. **SPAIN.**

Offices: 11, Queen Victoria St., London, E. C., Eng. Mine office: Cabrales, Asturias, Spain. H. Higgins, chairman; W. T. Rushton, secretary. Company is in debt and another reorganization is proposed. Lands include 7 copper mines and one coal mine. Has shipped 200 tons of 30% gray ore from the Don Fulano mine, which shows a 6′ vein. Mine supposed to have a 30-ton smelter.

SOCIETE MINIERE D'ALDEIRE. **SPAIN.**

Mine office: Aldeire, Guadix, Granada, Spain.

COMPANHIA MINEIRA ALEMTEJANA. **PORTUGAL.**

Office: 4, Praca dos Remolares, Lisbon, Portugal. Mine office: Beja Alemtejo, Portugal. Waldemar d'Orey, superintendent. Property is [illegible] group of old mines in the San Domingos district, showing two ore bodies occurring in schists, the selected ores giving about 25% copper from carbonate and sulphide ores. Property was discovered and operated by the Romans.

ALESSANDRO COPPER MINING CO. **NEW MEXICO.**

Office: 35 Union St., New Haven, Conn. Mine office: Silver City, Grant Co., N. M. Employs 10 men. Joseph C. Kelly, president; Edw. Parkhurst, secretary; Lucius P. Deming, manager. Organized April, 1900, under laws of West Virginia, with capitalization $500,000, shares $1 par. Debentures, $100,000 authorized at 6%; issued, $5,000. Lands, 50 claims, area 1,000 acres, also 5-acre millsite, in the White Signal, Burro and Anderson districts. Is developing 9 ore bodies, occurring as lenses, or impregnations in the neighborhood of porphyry, these giving average assay values of 8% copper and 5 oz. to 40 oz. silver per ton, principally from carbonate and sulphide ores. Has 9 shafts, from 40′ to 225′ in depth, also 9 tunnels, from 15′ to 400′ in length, with total underground openings of 1,300′. Has steam power and necessary mine buildings, with foundation built for a 50-ton concentrator and leaching plant. Plans continuing development and completing concentrator in 1904.

ALGOL MINE. CALIFORNIA.

Mine office: Spenceville, Nevada Co., Cal. Opened circa 1865, reopened 1899. Has a 50′ vein with 2″ to 10″ pay-streak, opened by two shafts, each 120′. Ores are cuprite, malachite and azurite, also native copper and a little native gold, giving average smelter returns of 20% copper. Has steam power.

ALGOMA COMMERCIAL CO., LTD. ONTARIO.

Office: Sault Ste Marie, Ont. C. M. Boss, superintendent. Property is the Elsie, Wilmot and other mines, 4 miles from Sudbury, Algoma, Ontario. Company is a subsidiary corporation of the Consolidated Lake Superior, which came to grief financially in fall of 1903.

ALGOMA & CALUMET DEVELOPMENT CO. ONTARIO.

Office: Calumet, Mich. Capitalization $400,000, shares $10 par; $40,000 issued. Lands are in Algoma, Ontario.

ALGONQUIN COPPER CO. WYOMING.

Office: 177 Broadway, New York. Henry H. Adams, secretary. Organized under laws of Wyoming, with capitalization $1,000,000.

ALICANTE GROUP. COLORADO.

Letter returned unclaimed from Wortman, Lake Co., Colo. G. C. Wortman, manager. Ores carry gold, silver, lead, copper and zinc. Has steam power and 35-ton concentrator. Presumably idle.

MINA EL ALICANTE. MEXICO.

Mine office: Mazapil, Zacatecas, Mex. M. Dolores Aguirre y Ca., owners; Vicente Banavides, superintendent. Ores carry gold, silver, lead and copper. Employs about 60 men.

ALICE MINE. MONTANA.

Mine office: Butte, Silver Bow Co., Mont. An old and once highly profitable silver producer, which is to be reopened, mainly for copper values.

ALICE GOLD MINING CO. WASHINGTON.

Office: 204 Empire State Bldg., Spokane, Wash. Mine office: Blue Creek, Stevens Co., Wash. Organized 1896, under laws of Washington, with capitalization $150,000, shares 10c par. J. F. Nylander, president; W. M. Higley, secretary and treasurer; Benj. F. Parker, general manager. Lands, 11 claims, area 225 acres, in the Chewelah district, showing 4 fissure veins and lenses, latter of considerable dimensions and carrying sulphide ores said to show good values in gold and copper, opened by two 200′ shafts and 2 short tunnels.

MINA DE ALJUSTREL. PORTUGAL.

Mine office: Aljustrel, Portugal. Owned by a Belgian company. Has chalcopyrite, associated with iron pyrites, giving 1% to 7% copper, and is a small but steady producer.

ALLEGHENY MINING CO. **NEW JERSEY.**

Organized 1901, to work old copper mines in Pahaquarry township, near Delaware Water Gap, Warren Co., N. J.

ALLENDE HERMANOS Y CA. **SPAIN.**

Mine office: Elizondo, Navarra, Spain. Don Pedro Allende, superintendent.

ALLIANCE COPPER MINING CO. **WASHINGTON.**

Absorbed by Iconoclast Consolidated Mines Co.

ALLOUEZ MINING CO. **MICHIGAN.**

Office: 60 State St., Boston, Mass. Mine office: Allouez, Keweenaw Co., Mich. Organized 1859, reincorporated 1889, under Michigan laws, with capitalization $2,500,000, shares $25 par, $18.55 paid in. New stock issue of 20,000 shares was divided pro rata among shareholders of record, June 1, 1901. Last assessment, $3 per share, levied October, 1901. Annual meeting, second Tuesday in March. H. F. Fay, president; Geo. G. Endicott, secretary and treasurer; Jas. Chynoweth, superintendent; H. F. Fay, Godfrey Morse, John C. Watson, Stephen R. Dow, Walter L. Frost, H. A. Tucker, W. B. Mosman, Geo. G. Endicott and Jas. Chynoweth; directors.

Official returns to the state of Michigan, as of date Jan. 1, 1903, disclose the following figures:

Amount cash paid in on capital stock..............	$1,855,767.00
Entire amount invested in real estate..............	73,303.57
Amount of personal estate........................	128,782.93

Company has on hand cash estimated to be sufficient to sink the new shaft to the lode without another assessment.

Lands are about 3,600 acres all told, of which a compact tract of 640 acres contains the old Allouez mine proper and the new mine now being opened. Areas of between 11 and 12 acres were exchanged between the Allouez and Ahmeek, to mutual advantage, in 1903.

The old mine, opened 1859, is on the Allouez conglomerate, a bed underlying the greenstone that is such a noticeable rock stratum in Keweenaw county. The conglomerate is 30′ wide in many places, with strike of N. 39°E, and dip of 38°. Lode averages 0.7% to 1% copper, and is very refractory under the stamps. There are 3 shafts, deepest about 1,700′. Mining was begun actively in 1869, and stopped in 1877, with an exhausted treasury. The mine was then leased to Watson & Walls, who made money from it, after paying a royalty of one-eighth on gross production. In 1880 the company resumed control, to quit once more, financially exhausted, in 1885. Watson & Walls took the mine again and once more did well; the company resumed work on its own account for the third time, and again lost money, stopping all work in 1892. Has been idle for some years, except for exploratory and development work 1898-1890, when a shaft was sunk 1,200′ on the Osceola lode, and nearly 4,000′ of openings secured thereon, with indifferent results. The shaft-house at the Osceola shaft has been demolished. The old conglomerate workings were unwatered in 1902, and the old mine is still kept pumped out. The stamp-mill, on Hills Creek, is of antique pattern, with 3 heads. The Allouez has made 13,025 tons, 1,528 lbs. of refined copper.

The repeated heavy losses of the old conglomerate mine, and failure to open a profitable mine on the Osceola lode have given the Allouez a bad name among investors. Present development is on the Kearsarge lode, which promises to recoup all past losses. This lode shows extremely well in the North Kearsarge, just south of the Allouez, and a half mile to the north on the Ahmeek lands, but does not outcrop on the Allouez tract, although underlying the entire 640 acres, consequently must be opened on the underlay. The Kearsarge shaft was started May 15, 1903, on the extreme southeast corner of the property, and should reach the Kearsarge amygdaloid at a depth of approximately 1,000′, about the close of 1904. The shaft is sunk at an angle of 80°, changing to 75° near the collar of the shaft, and is planned to take the angle of the lode, about 38°, when the bed is cut. The shaft has 2 compartments, with 3-ton skips and hoist good for depth of half a mile, and was 280′ deep at the close of 1903. Owing to the exceeding steepness of shaft, only 10° less than vertical, back-rails of 6x10″ timber are set so close to the wheels of the skips that their flanges cannot leave the steel rails, the wooden timbers really serving as guides. At the change of angle from 80° to about 38° on reaching the lode, a single idler with very wide flange will care for the cables passing at either end. In order to save pumping charges on surface-water entering the mine, an extremely ingenius plan has been devised. A gutter has been cut entirely around the shaft, leading to an opening 36′ long, half winze and half drift, used as a sump from which the water is forked. The shaft has a temporary shaft-house, with permanent stone foundation in place for rock-house addition. The 25x40′ boiler-house has two 125-h. p. boilers. The site is swampy and is being filled to depth of 10′ with rock taken from the shaft. Eventually a second shaft will be sunk about 1,700′ to the northeastward. No. 1 shaft on the Kearsarge lode can be sunk to depth of almost 2 miles on the Allouez lands. In starting this shaft the Kearsarge conglomerate was cut, this showing a very wide bed with narrow pay-streaks only. The mine has necessary shops and a large number of dwellings at the old Allouez location, and is served by the Mineral Range railroad.

The prospects of the Allouez were never so bright, nor founded on so sure a foundation as now. The chances of opening a paying mine are overwhelmingly in favor of the company, but the work will require four or five years and some heavy assessments. However, the property should amply reward those who have faith in it and hold their shares.

ALMA MINE. **BRITISH COLUMBIA.**

Mine office: Lardo, B. C. A prospect, owned by a Boston company, carrying auriferous copper ores. Employs 8 men.

ALMA COPPER MINING CO. **MEXICO.**

Office: Des Moines, Ia. Mine office: Carbo, Ures, Sonora, Mex. Abner Graves, general manager; Nelson D. Graves, superintendent. Lands, 717 acres. Has auriferous, argentiferous and somewhat bismuthiferous copper ores, in the forms of malachite, azurite, chrysocolla, cuprite and melaconite, assaying up to 37% copper and $13 gold per ton. Has gasoline power, with fair outfit of developing machinery, and is considering the construction of a smelter.

ALMA GOLD MINING CO. COLORADO.

Office: Idaho Springs, Clear Creek Co., Colo. J. J. May, supt. Ores carry gold, silver and copper. Has steam power and employs 25 men.

ALMADO & TERITO CONSOLIDATED MINING CO. MEXICO.

See Negociacion Minera de Clemente Ybarra.

ALMEDA MINING CO. OREGON.

Office: 414 Abington Bldg., Portland, Ore. Mine office: Galice, Josephine Co., Ore. Employs 12 men. O. M. Crouch, president; R. C. Kinney, secretary and treasurer; John F. Wickham, general manager. Organized Sept. 17, 1900, under laws of Oregon, with capitalization $1,000,000, shares $1 par. Lands, 7 claims, area 140 acres, also 5-acre millsite and 30 acres miscellaneous lands, in the Galice district, showing a contact vein between porphyry and slate said to be 107′ wide and traceable 2,300′, giving average assays of 3% copper and $4.50 gold per ton, with traces of silver and lead, from chalcopyrite. developed by 8 tunnels, longest 310′, having 970′ of underground openings. Was originally worked to slight depth for free gold, circa 1860-1870. Company plans continuing development, installing power drills, building 6 miles of wagon road, developing water power and building a 100-ton matting furnace in 1904.

ALMERIA QUICKSILVER & COPPER CO., LTD. SPAIN.

Offices: 17, Royal Exchange Square, Glasgow, Scotland. Mine office: Berja, Almeria, Spain. W. D. Gillies, chairman; W. G. Millar, secretary. Capital, nominal, £45,000, shares 6s. par; issued, £38,695. Lands, 1,100 acres, carrying ores of quicksilver and copper.

ALMOLOYA MINING CO. MEXICO.

Office: 305 Trust Bldg., Los Angeles, Cal. Mine office: Dorado, Chihuahua, Mex. Organized under laws of Arizona with capitalization $2,000,000. Employs 40 to 50 men. N. O. Bagge, president; I. B. Newton, secretary; D. W. Shanks, general manager; Los Angeles Trust Company, registrar and trustee. Lands, 57 pertenencias, area 148 acres, near the famous Cigarrero mine, in the Sierra de Almoloya, an isolated mountain range on the Parral branch of the Mexican Central railroad. Is sinking 3 two-compartment vertical shafts, planned for depths of 300′, 500′ and 1,000′. Ores carry gold, silver, lead and copper.

ALPS MINING CO. COLORADO.

Mine office: Central City, Gilpin Co., Colo. James Williams, superintendent. Ores carry gold, silver and copper. Has steam power.

ALSACIA DEVELOPMENT CO. MEXICO.

Office: care of Chas. F. Wren, secretary, Bisbee, Ariz. R. H. Wren, president. Lands are in the Ajo mountains, Arizpe district, Sonora, Mexico, and show ores carrying silver, copper and lead.

ALTAMONT MINING CO. **NEW MEXICO.**

Office: care of Capt. L. H. Williams, president, Altamont, Ill. Lands, showing copper ores, are in the Jarilla district of New Mexico.

ALTENS KOBBERGRUBER. **NORWAY.**

Office: care of Consul Nils Persson, owner, Helsingborg, Sweden. Mine office: Kaafjord, Finmarken, Norway. Otto Witt, general manager; P. W. George, mining engineer; E. Walseth, chemist; R. Rusten and Gustaf Swensson, mine superintendents. Is the northernmost copper mine of the world, being located near North Cape, in 70° north latitude. Mining lands, 200 claims, patented, area about 500 acres, also 2-acre millsite and 2,000 acres of miscellaneous lands, in the Altens district. Property shows about 30 fissure veins of copper and iron pyrites, 12 of which are more or less developed, these averaging 10′ width and 3,000′ length, carrying suphide ores of rather low grade. Underground openings are about 12,000′. Mine is 300 miles from a railroad, but only 300 feet from the sea, by which shipments are made and received. Equipment includes hoists, air and diamond drills, electric light, etc. Power is supplied by a Pelton wheel fed by a 1,000′ waterfall. New concentrator has 100 tons daily capacity. Property is excellently handled.

ALVERDSKI & SHAMBLURGSKI WORKS. **RUSSIA.**

Office: care of A. A. Broli, owner, Tiflis, Russia. Mines are in the government of Tiflis, Caucasus, Russia. Production in 1899 was 162,142 lbs. of refined copper.

AMADOR CONSOLIDATED MINING & DEVELOPMENT CO. **MONTANA.**

Office: 507-172 Washington St., Chicago, Ill. Mine office: Iron Mountain, Missoula Co., Mont. Employs 60 men. G. H. Loehr, president; D. E. Mackinnon, secretary; Robt. M. Mahler, treasurer. Organized March 16, 1903, under laws of Arizona, with capitalization $10,000,000, shares $5 par, as a reconstruction of the Amador Copper & Gold Mining & Milling Company, to secure additional funds imperatively demanded for development. Lands, 18 claims, area 355 acres, also 2 groups of patented placer-gold claims, area 180 acres, with 5 mill and smelter sites and 450 acres miscellaneous lands, showing 5 fissure veins in slates and quartzite, of which 3 veins of 40′ to 270′ width are undergoing development, these giving oxide and sulphide ores, mainly chalcopyrite with a little chalcocite, assaying 3% to 34% copper, 3 oz. to 16 oz. silver and $6 gold per ton. Main ore body on the east drift of the 250′ level is 1,325′ long and 35′ wide, with 10′ of sulphide smelting ore and about 20′ of fair sulphide concentrating ore. Main shaft is 400′, with tunnels of 187′, 512′, 632′ and 662′, estimated by company to show 365,000 tons of ore blocked out for stoping. Has a 2-mile flume and pipeline, delivering water at mine under a 210′ head. Has an air-compressor, 4 power drills, 2 hoists and 15 mine buildings and dwellings and a sawmill. For 1904 management plans sinking a 3-compartment main shaft to depth of 600′, with drifts at 500′ and 600′ levels, and building a railroad to connect with the Northern Pacific at Iron Mountain, 8 miles distant. Also plans installation of reduction plant, and is building a 3-mile flume, 6x6′, to deliver water under a head of 250′, planned to develop about 5,000 h. p.

AMADOR COPPER & GOLD MINING & MILLING CO. MONTANA.

Reorganized, 1903, as Amador Consolidated Mining & Development Co.

AMALGAMATED COPPER CO. MONTANA.

Office: 52 Broadway, New York. Organized April 27, 1899, under laws of New Jersey, with capitalization $75,000,000, increased in 1901 to $155,000,000, shares $100 par. Henry H. Rogers, president; Wm. G. Rockefeller, secretary and treasurer. Directors are H. H. Rogers, Wm. G. Rockefeller, Albert C. Burrage, Wm. Rockefeller, Fred P. Olcott, James Stillman, Anson R. Flower and Geo. H. Church. Annual meeting, first Monday in June. Registrars, Central Trust Company of New York and National Shawmut Bank of Boston; transfer agents, National City Bank of New York and Kidder, Peabody & Co., of Boston.

The Amalgamated is not a mining company, being merely a securities holding corporation, with assets consisting of stock in sundry subsidiary companies. Stock of the following named corporations is entirely owned by the Amalgamated, with the exception of the few founders' shares, required to be in the names of directors: Washoe Copper Co., capitalization $5,000,000; Colorado Smelting & Mining Co., capitalization $2,500,000; Diamond Coal & Coke Co., capitalization $1,500,000; Big Blackfoot Milling Co., capitalization $700,000. In the following named corporations the Amalgamated holds from practically the entire issue, as in the case of the Boston & Montana, to a majority interest only, as in the Anaconda: Boston & Montana Consolidated Copper & Silver Mining Co., capitalization $3,750,000; Parrot Silver & Copper Co., capitalization $2,298,500; Butte & Boston Consolidated Mining Co., capitalization $2,000,000; Anaconda Copper Mining Co., capitalization $30,000,000; Hennesy Mercantile Co., capitalization $1,500,000. The Amalgamated is also credited with owning a controlling interest in the United Metals Selling Company. No reports are issued, annually or otherwise, and shareholders asking for information are practically told, politely but firmly, to "go to the devil."

The company began the payment of regular quarterly dividends of 1.5% immediately after its organization, these regular dividends being supplemented by extras of ½% quarterly, giving an annual return of 8%, until October, 1901, when the extra dividend was dropped, the regular quarterly dividends being reduced to 1% in January, 1902, and to ½% in May, 1903, or at the rate of 2% yearly, where they have since remained. Several millions of dollars due the Amalgamated on its holdings of Boston & Montana stock are retained in the treasury of the latter corporation, owing to sundry injunctions of Montana courts, but eventually this money must be paid over to the Amalgamated. The net earnings of the company were undoubtedly in excess of 4% in 1903. The force employed by the various corporations subsidiary to the Amalgamated is about 13,000 men, mainly at Butte, Anaconda and Great Falls, Montana. In addition to its mines, mills, smelters and stores, the Amalgamated owns most of the daily newspapers in Montana, but the profits of one, the leading newspaper of the state, are eaten up by the losses on others of its subsidized publications.

The Amalgamated was formed, nearly five years ago, to acquire control of the copper industry of the world. This ambitious plan was modified a little later to acquiring control of the American copper industry. After five years of effort the corporation does not yet control the copper industry of Montana alone. Litigation with the Heinze interests, conducted through various subsidiary corporations, is protracted and costly. The management of the Amalgamated has been guilty of a series of tactical blunders, the greatest of which was the maintenance of artificially high prices for copper until nearly the close of 1901, followed by an attempt to cut the price of the metal in two, failure following both attempts. The management has learned, however, by its past errors, and is now conducted along somewhat more prudent lines, although the stiff-necked attitude taken in the Montana fight is not conducive to the best interests of shareholders. For that matter, the interests of the shareholders are never taken into consideration by the management. The public can buy or sell shares on its own responsibility, and take what comes, the nature of what is coming being known only to the management. The Amalgamated has proven a sore disappointment to the men of millions responsible for its formation, who, through success in other lines of business, had gained an unduly exalted opinion of their own abilities. The company is still the most important factor in the world's copper market, and for the past year or more has manifested a wholesome disposition to allow the price of the metal to follow a natural rather than an artificial course.

In addition to its direct and indirect holdings in Montana, the Amalgamated company is more or less closely affiliated, through the United Metals Selling Company, with the Utah Consolidated and the Osceola, Tamarack and Isle Royale mines of Michigan, and individual directors of the Amalgamated probably own a large amount of stock in the Utah Consolidated, but have no holdings of importance in any of the Michigan mines.

The copper production controlled by the Amalgamated may be estimated in three different ways: first, through the sales of the United Metals Selling Company, which agency handles the copper of a large number of independent mines, not always in accord with the Amalgamated policy; secondly, on the basis of the gross production of the Montana companies, owned or controlled by the Amalgamated company. These Montana mines, if worked to their full capacity, should make upwards of 20,000,000 pounds monthly, or more than 250,000,000 pounds annually, but actually fall short of this production, though the productive capacity of these mines is about 10,000 tons of ore daily. For the year ending June 1, 1903, the copper production of these Montana mines was about 233,500,000 pounds, and for the calendar year 1903 was probably a little less than 220,000,000 pounds, of which the share of the Amalgamated was 170,000,000, or upwards, the exact amount being necessarily dependent upon the very uncertain stock interests now held by the Amalgamated company in the Anaconda mine, this last figure being the third and correct estimate of Amalgamated production. What the exact profits of the company may have been in 1903, or for any other period, is known only to the directors, who have no intention of sharing such valuable information with the mere shareholders.

So far the Amalgamated Copper Company has failed in everything it has ever attempted. That so many and such conspicuous failures will be scored in the future is scarcely probable, but the present policy of the company is far from reassuring, although somewhat improved upon the extremely fatuous operations of the first three years of the "copper trust's" existence.

AMALGAMATED GOLD & COPPER CO. ARIZONA.

Office: care of Douglas, Lacey & Co., 66 Broadway, New York. Letter returned unclaimed from former mine office, Huron, Yavapai Co., Ariz. Organized under laws of Arizona, with capitalization $2,000,000, shares $1 par. A. J. Brockett, president; Fredk. F. Lacey, secretary. This is one of the numerous promotions of Douglas, Lacey & Co., a New York firm that advertises very extensively and has about 40 branch offices and agencies in the principal investment centers of the United States, Canada and Mexico. Douglas, Lacey & Co. have been highly successful in peddling stock, mainly to people of limited means and more limited knowledge of mining matters. A number of their companies have paid dividends, but satisfactory evidence is lacking that these dividends were ever earned from actual mining, and there is ample reason for fearing that the dividends so paid were from money received through further sales of stock. The firm is doing some actual mining work on certain of its properties, and is constantly promoting new flotations. Old customers, dissatisfied with previous purchases, are given the opportunity to take stock in new companies. This plan of doing business is unsafe, and it is but a question of time when a great majority of these companies, dividend payers and all, will fall of their own rotten weight. It is possible, of course, that the company may stumble onto a good mine by sheer luck, but such a possibility is poor basis for dividends. The methods used by Douglas, Lacey & Co. in their promotions are reprehensible, and it is to be regretted that through the power of heavy advertising they have succeeded in shutting the editorial mouths of many, if not all, of the leading mining and financial journals of the United States.

GEWERKSCHAFT VER. AMALIA UND KNOTTENBERG. GERMANY.

Letter returned unclaimed from former mine office, Mornshausen an der Dautphe, Hessen-Nassau, Germany.

AMARANTH GOLD MINING CO. ARIZONA.

Mine office: Maxton, Ariz. S. J. Goldie, superintendent. Lands, 14 claims, including the Stormcloud. Ores carry gold, silver and copper. Has steam power.

AMERICA-BRITANNIA MINING CO. WASHINGTON.

Mine office: Baring, King Co., Wash. C. Campbell, superintendent.

AMERICAN CONSOLIDATED COPPER CO. NEW MEXICO.

Office: 44 East Broad St., Columbus, Ohio. Mine office: Santa Fe, Santa Fe Co., N. M. Employs about 75 men. Organized 1901, under laws

New Mexico, with capitalization $5,000,000, shares $1 par. Adelbert R. ibson, president and general manager; D. A. Walker, vice-president and reasurer; W. B. Randall, secretary. Lands, 32 claims, area 640 acres, valid itle to which was secured in 1903, after litigation in federal courts. Property is in 5 groups, all in New Mexico. The Atwood group of 6 claims is in the Shakespeare district of Grant county; the Don Bernardo group of 14 claims is in the White Signal district of Grant county; the Sunlight group of 4 claims is in the San Andreas district of Socorro county; the El Paso-Rock Island group of 4 claims is in the Gallinas district of Lincoln county, and the Copper Age group of 4 claims is in Los Cerrillos district of Santa Fe county. Development is under way on all 5 groups, with principal operations on the Atwood group. These various properties show 8 fissure veins, of which the 3 principal range 4′ to 70′ in width, with estimated average values of 12% copper, 5.5 oz. silver and $14 gold per ton, mainly from oxide and sulphide ores, with a limited quantity of carbonates. Has 11 shafts of 40′ to 100′, with 3,000′ of underground openings and about 60,000 tons of ore blocked out for stoping. Has steam power and a 50-ton concentrator and plans building a new mill. Ships smelting ores to El Paso, and was mining about 60 tons daily in June, 1903. Is experimenting with various leaching processes for the lixiviation of large bodies of low-grade ore. Property is regarded as valuable.

AMERICAN CONSOLIDATED MINES CO. **NEW MEXICO.**

Office: 23 Postoffice Bldg., Colorado Springs, Colo. Mine office: Twining, Taos Co., N. M. Employs 12 men. J. Shumaker, president; C. D. Weimer, secretary and treasurer; O. H. Stanley, general manager; E. H. Souther, superintendent. Organized November, 1901, under laws of New Mexico, with capitalization $3,000,000, shares $1 par. Lands, 19 claims, area 380 acres, also a 5-acre millsite and half interest in 380 acres of timber lands, in the Rio Hondo and Lake Fork districts. Has secured assays of 3% copper and $16 gold per ton from 3 tunnels, longest 510′. Contemplates continuing development and installing an air-compressor in 1904.

AMERICAN COPPER CO. **ARIZONA.**

Office: 11 Broadway, New York. Mine office: Val Verde, Yavapai Co., Ariz. Organized under laws of Arizona, with capitalization $5,000,000, shares $1 par. Employs about 100 men. J. K. Burnham, president; A. S. Kimberley, secretary and treasurer; Benj. Blanchard, superintendent. Lands, 20 claims, area 400 acres, including the Iron King mine, in the Big Bug district. Has shafts of 100′, 170′ and 260′, with about 5,000′ of underground openings, showing a large ore body, estimated to give 350,000 tons averaging $10 per ton of ore blocked out for stoping. Principal values are in gold and silver, with lead and copper as by-products. Has steam power and 6-stamp mill, stamps being fitted with 1,000-lb. shoes and having quadruple discharge, mill having a daily capacity of 40 to 50 tons. Has a 50-ton cyanide plant and is said to plan building a 500-ton concentrator and smelter, to ost $250,000. Has electric light, steam and water power, necessary mine uildings, dwellings for workmen, store and combination church and school uilding.

AMERICAN COPPER CO. **WYOMING**

Office: 327 Pine St., Williamsport, Pa. Mine office: Holmes, Albany Co., Wyo. Employs 15 to 20 men. Thos. M. B. Hicks, president and treasurer; Otto C. Clinger, secretary; LeRoy Scholl, superintendent. Organized Aug. 23, 1902, under laws of Wyoming, with capitalization $1,000,000, share $1 par. Lands, 5 claims, area 100 acres, in the Douglas Creek division o the Encampment district, showing a fissure vein in granite, 20' wide at depth and composed of three distinct layers, first being porphyritic, with width of 6' to 7' and carrying about 1.5% copper and $7 gold per ton, with some covellite assaying 60% copper and $20 gold per ton; second layer of 6' to 7', of jaspelite and diorite, carries decomposed iron ore assaying $20 to $150 gold per ton; the third layer is brecciated, carrying oxide, carbonate and sulphide ores of copper, with quartz gangue. Has a 3-compartment main shaft, 100' deep, planned to be sunk to 1,000', also other shafts of 50', 60' and 160'. Has a 100-h. p. steam equipment, with Norwalk air compressor, power drills and necessary mine buildings. Property regarded as promising.

AMERICAN COPPER MINING CO. **NEW JERSEY.**

Office: 20 Broad St., New York. Mine office: Somerville, Somerset Co., N. J. Organized 1885, under laws of New York, with capitalization $500,000, shares $1 par. Josiah C. Reiff, president; W. S. Chapman, secretary; Josiah Bond, general manager; John T. Downey, mine superintendent. Lands, mining rights to about 1,000 acres and a 50-acre millsite owned in fee. Ore occurs as blanket veins between trap and shale, these having an average thickness of 2' and being traceable nearly 4 miles, carrying an estimated minimum average of 2% to 2.5% copper, with small gold and silver values. Native copper occurs at depth, with various oxides and carbonates above, in a gangue of altered shale. Mine is opened by 3 inclines of 155', 450' and 1,300', also a 500' crosscut drainage tunnel. Has steam power, with 30-h. p. hoist, 5-drill Rand air-compressor and drills, tramway and necessary mine buildings. The concentrator is of wood and stone, with daily capacity of 50 tons, having 2 rolls, screens, crushers and 2 Wilfley tables. Product, when mine is operated, is turned out as concentrates, shipped to smelters on New York harbor. Company plans continuing development work in the Chimney Rock tunnel.

AMERICAN COPPER MINING CO.

Office 4 Campau Bldg., Detroit Mich. John Baker, president and general manager. Location of property, if any, unknown.

AMERICAN COPPER MINING CO.

A "snide" concern, former office at 40 Wall St., New York.

AMERICAN COPPER MINING & EXTRACTION CO. **COLORADO.**

Office 828 Equitable Bldg., Denver, Colo. Owns the Gardiner copper leaching and precipitating process, which is in successful commercial use at the Denver plant of the Union Ore Extraction & Reduction Co.

AMERICAN COPPER MINING & SMELTING CO. **NEW MEXICO.**

J. R. Kerr & Co., 335-41 Broadway, New York, "fiscal agents" of company, removed and left no address behind. Property was advertised as a developed mine, shipping ore to smelters, but was not found in New Mexico.

AMERICAN GOLD MINING CO. COLORADO.

Office: 304-411 Olive St., St. Louis, Mo. Mine office: Ouray, Ouray Co., Colo. Employs 40 men. W. C. Wrisberg, president and general manager; Ernest P. Olshausen, secretary and treasurer; V. A. Laughlin, superintendent; Ed. Wall, mine superintendent. Organized 1889, under laws of Colorado, with capitalization $3,000,000, shares $10 par. Has paid dividends of $420,000. Lands, 13 patented claims, area 200 acres, including the American Nettie and West View mines, also 50-acre millsite, in the Ouray district. Country rocks are granite, shale and quartzite. Produces oxide and sulphide ores averaging 2% copper, 1% lead, 20 oz. silver and 20 cents gold per ton. Has 70,000′ of underground openings, with 100,000 tons of ore blocked out for stoping, and 200,000 tons in sight. Has steam, electric and water power, with 40-stamp mill and concentrator, shipping concentrates to the Pueblo smelter.

AMERICAN GOLD MINING COMPANY OF NEW MEXICO. NEW MEXICO.

Office: 314 Tacoma Bldg., Chicago, Ill. Mine office: Nogal, Lincoln Co., N. M. J. M. Rice, manager; M. D. Gaylord, superintendent. Operates the American, Helen, Old Abe and other mines, producing gold, silver, lead and copper, latter as a by-product. Has steam and electric power, with a 50-stamp mill and 50-ton cyanide plant, and employs about 100 men.

AMERICAN GOLD & COPPER CO. ARIZONA.

Office: 401 Henne Bldg., Los Angeles, Cal. Mine office: Morristown, Maricopa Co., Ariz. A. B. Hall, superintendent; J. J. Hawkins, attorney. Capitalization $1,000,000, shares $1 par. Lands, about 100 acres, including Fitzhugh Lee, Joe Wheeler and Eddy mines. Has auriferous and argentiferous copper ore, with steam power and a 10-stamp mill.

AMERICAN GOLD & COPPER MINING CO. WYOMING.

Office: 1431-79 Dearborn St., Chicago, Ill. Mine office: Jelm, Albany Co., Wyo. Albert L. Stone, president; J. C. Essick, secretary; Frank T. Wyatt, general superintendent. Capitalization $5,000,000. Lands, 14 claims, held by location.

AMERICAN MINES DEVELOPMENT CO., LTD.

Office: 506 Oneida Bldg., Minneapolis, Minn. R. R. Bailey, president; Jas. T. Manning, secretary, treasurer and manager. Claims to own and to be developing copper, gold, zinc, lead and oil properties, but furnishes no particulars as to location of same.

AMERICAN MINING CO. IDAHO.

Mine office: Weiser, Washington Co., Idaho.

AMERICAN MINING, MILLING & SMELTING CO. UNITED STATES & MEXICO.

Offices: 80 Wall St., New York, 315 Commercial Bldg., St. Louis, Mo. and 10, Coleman St., London, E. C., Eng. Jas. Reid, president and treasurer; W. Matthews, general manager; C. Edwards, consulting engineer; H. Reid, secretary. Organized, May, 1896, with capitalization $1,500,000, in 150,000 shares 7½% cumulative preference stock of $5, and 750,000 ordinary $1 shares. Dividends of 15% per month were paid on the ordinary shares 1902 and 1903, and on Jan. 15, 1904, and for 1903 the guaranteed dividend of 7½% and a bonus of 2½% were paid on the preferred stock. Company has never made a default in dividends during its existence. The reserve fund at close of 1903 was $2,383,390.25, and net profit to June 30, 1903 was $5,068,704.39. The company's holdings include 36 different mines of copper, gold and silver, with sundry custom smelters, mills, etc., in Alaska, Arizona, California, Colorado and Mexico. This company appears to be an exceptionally successful mining enterprise, conducted along sound lines.

AMERICAN SMELTING & REFINING CO. NORTH & SOUTH AMERICA.

Office: 71 Broadway, New York. Organized April 4, 1899 under laws of New Jersey. Present capitalization is $100,000,000, half common and half 7% cumulative preference shares. A dividend of 5% on common shares was paid in December, 1903. For fiscal year ending April 30, 1903, company showed net earnings of $7,576,786, an increase of $2,715,167, leaving a cash surplus of $2,339,154, with assets of $109,425,286.14. E. W. Nash, president; Danl. Guggenheim, chairman executive committee; Barton Sewell, vice-president; Isaac Guggenheim, treasurer; N. Suht, assistant treasurer; Edw. Brush, secretary; W. E. Morriss, assistant secretary; August Raht, mechanical engineer.

On May 1, 1903, the company had plants with an annual capacity for smelting 3,720,000 tons of ore, and refining plants capable of handling 340,000 tons of pig lead and 36,000 tons of blister copper yearly.

The company owns the following smelters: Germania Lead Works and Hanauer Smelting Works, Salt Lake City, Utah; a copper smelter at Murray, 9 miles from Salt Lake City, R. D. Rhodes, superintendent, new and modern throughout, with 2,000 tons daily capacity, having steam and electric power, and employing nearly 1,000 men; United States smelters, at Helena and Great Falls, Mont.; National Smelting Co., Chicago; Omaha smelter, at Omaha, Neb.; Grant and Globe smelters, Denver, Colo., Franklin Guiterman, manager; H. H. Alexander and C. H. Livingstone, superintendents; Pueblo Smelting & Refining Co., including the Eilers plant, Geo. A. Harsh, superintendent, the Philadelphia plant, S. C. Hazelton, superintendent, and the Pueblo plant, W. H. Howard, superintendent, all at Pueblo, Colo.; San Juan smelter, Durango, Colo.; Bi-Metallic smelter, Leadville, Colo.: Pennsylvania lead smelters, Salt Lake City, Utah, and Pittsburg, Pa; Chicago and Aurora smelters, Chicago and Aurora, Ill., and Leadville Colo.: Kansas City smelters, Kansas City, Mo.; El Paso smelters, F. C. Earle, superintendent, El Paso, Texas; Guggenheim smelters, Pueblo, Colo., Monterey and Aguascalientes, Mexico, latter having 2 new 300-ton convertible furnaces building at close of 1903, for use interchangeably on lead and copper ores; Guggenheim Refinery, Perth Amboy, N. J.; El Carmen smelters, El Carmen, and Sierra Mojada, Chihuahua, Mex.; Velardeña smelter, Velardeña, Durango, Mex.; Playa Blanca smelter, leased from Compania Minera Huanchaca, Willard S. Morse, general manager, at Antofagasta, Chili. The company is interested extensively in Mexican mines of lead, silver and copper, operated to feed its smelters. This is much the largest smelting corporation in the world, and is managed with signal ability.

AMERICAN ZINC EXTRACTION CO. **ARIZONA.**

Mine office: Tucson, Pima Co., Ariz. Lands include the San Xavier mine, with ores of silver, lead and copper. Has steam power.

AMPARO MINING CO. **MEXICO.**

Office: Philadelphia, Pa. Mine office: Etzatlan, Jalisco, Mex. H. E. Williams, manager. Property is El Cusco mines, said to have a small pocket of rich ore carrying gold, silver, lead and copper.

AMY C. MINE. **COLORADO.**

Mine office: Idaho Springs, Clear Creek Co., Colo. John Owen, owner; Geo. Riley, superintendent. Ores carry gold, silver lead and copper. Has steam power.

AMYGDALOID MINE. **MICHIGAN.**

Office: care of J. F. Carey, Escanaba, Mich. Lands, 2,240 acres, in Keweenaw county, Michigan. Has 6 shafts and 7 levels, and has produced 770 tons, 180 lbs. of refined copper. Idle since 1874.

ANACONDA MINE. **NEW MEXICO.**

Mine office: San Pedro, Santa Fe Co., N. M. Carruthers & Field, owners and managers. Ores carry gold, silver, lead, copper and zinc. Has steam power and a small smelter.

ANACONDA CONSOLIDATED COPPER MINES AND SMELTING WORKS.

Sold to Murrin Copper Mines, Ltd.

ANACONDA COPPER MINING CO. **MONTANA.**

Office: 52 Broadway, New York. Mine office: Butte, Silver Bow Co., Mont. Is the largest copper producer of the world, employing about 5,000 men, under normal circumstances. Organized June 18, 1895, under laws of Montana, with capitalization $30,000,000, shares $25 par. Wm. Scallon, president; Henry H. Rogers, vice-president; Wm. G. Rockefeller, treasurer; W. H. Dudley, secretary; F. P. Addicks, assistant secretary; John Gillies, superintendent; D. W. Brunton, consulting engineer; Geo. D. Case, smelter superintendent; C. H. Repath, chief constructing engineer; R. G. Collins, assistant constructing engineer. Directors are W. L. Bull, A. C. Burrage, H. H. Rogers, Wm. Rockefeller, W. G. Rockefeller, E. C. Bogert and Wm. Scallon. Transfer agent, National City Bank, of New York. Annual meeting is in May. Stock is listed on New York, Boston and London stock exchanges. Dividend coupons are payable in England by the London Joint Stock Bank, Ltd., Princes St., E. C., with warrants to bearer issued in denominations of 5, 20 and 50 shares.

Operations for the three preceding fiscal years ending June 1 are compared as follows:

	1901.	1902.	1903.
Gross yield per ton	$ 14.20	$ 10.66	$ 10.48
Cost of mining per ton	3.97	3.80	3.49
Total mining cost	5,069,071.00	3,742,312.00	4,862,420.83
Cost transportation per ton	.15	.15	.15
Total cost of transportation	191,534.00	147,743.00	208,925.18
Cost of reduction per ton	4.14	3.32	3.39
Total cost reduction	5,288,720.00	3,267,182.00	4,718,155.13
Paid for labor	5,572,392.00	3,860,789.00	5,269,005.35
Paid for machinery	4,785,399.00	3,148,705.00	4,311,570.61
Cost of marketing	2,007,415.00	2,052,105.00	3,207,151.67
Gross proceeds	18,128,558.00	10,498,953.00	14,597,852.14
Recapitulation:			
Cost of mining	5,069,071.00	3,742,312.00	4,862,420.83
Freight on ore	191,534.00	147,743.00	208,925.18
Cost of reduction	5,288,720.00	3,267,182.00	4,718,155.13
Selling and marketing	2,007,415.00	2,052,105.00	3,207,151.67
Total expenditures	12,556,740.00	9,209,342.00	12,996,652.81
Net proceeds	5,571,818.00	1,289,611.00	1,601,199.33
Tons of ore treated	1,276,890	984,958	1,392,835

Earnings for the year ending June 1, 1903, were about $1.25 per share, from which semi-annual dividends of 50 cents per share were paid in November, 1902, and May, 1903.

The mine was opened in 1880, by J. B. Haggin, Marcus Daly and Senator Hearst, for silver. At a depth of about 150′ the silver values decreased, being replaced by high-grade copper ores, principally chalcocite and bornite. The company's mines at Butte include the Anaconda, Never Sweat, St. Lawrence, High Ore, Green Mountain, Mountain Consolidated, Bell and Diamond, which are regularly operated, also the Modoc, Wake-up-Jim and other idle mines, including a number of mining claims of more or less prospective value, while miscellaneous landed holdings include sundry timber lands and coal mines. The country rock, known as the Butte granite, is basic, with an intrusive acid rock known as the Bluebird granite, and a quartz-porphyry for the third rock of the series in age, the entire mass being shattered by fissures carrying argentiferous and auriferous copper ores. The ores are mainly sulphide, largely chalcocite and bornite with some chalcopyrite, and a considerable amount of enargite, the ores having a gangue of quartzite and decomposed country rock. The oxide and carbonate ores usually found near surface in copper mines are not frequent in the Butte district, the granitic country rock being unfavorable to their formation. Like the veins of all other known mining fields, the Butte ores grow leaner with depth, but the lowest openings show ore bodies of great persistence and strength, carrying enormous quantities of disseminated ores running 3% to 6% in copper. Sufficient medium and low-grade ore is developed to enable the Anaconda to produce 75,000,000 to 100,000,000 tons of refined copper annually for many years to come. A considerable number of stopes of high-grade ore remain untouched, but these are not in sufficient number to greatly raise the average percentage of the ores remaining unmined. Ores smelted give an average return of about 65 lbs. of copper per short ton, or 3.25% copper, with 3 oz. silver and average values of $1.75 to $2 gold and silver per ton.

Of the Anaconda company's mines, the Anaconda proper employs 600 to 800 men, having a 3-compartment 1,800′ main shaft, timbered with 10x10″ square sets, with good ventilation and about 30 exits, having underground connections with the Never Sweat, Bell and St. Lawrence mines. Eight-ton skips are swung under double-deck cages worked in counterbalance. The Never Sweat has a 2,200′ main shaft, with an 8,000-h. p. hoist, and employs about 500 men. The St. Lawrence has a 2,000′ three-compartment main shaft, with 22 exits, employing about 700 men, normally. This mine has been on fire since 1890. The fire is in an extensive area above the 300′ level, and is constantly fought. To prevent or retard its spreading, solid masonry bulkheads are built to cut off its progress. A complete fire fighting brigade is kept constantly on duty, working regular 8-hour shifts. The mine water carries 9 to 13 lbs. copper per ton, and part of the copper contents are precipitated underground on scrap-iron in concrete sumps, and the water again leached on surface, which it reaches carrying 2 to 4 lbs. only of copper per ton. The High Ore mine employs 200 to 300 men, and has a 2,300′ three-compartment main shaft, the deepest in the camp. This shaft unwaters nearly all of the Anaconda mines, having 7 powerful pumps, 3 on the 1,000′ level, 2 on the 1,600′ level and 2 on the 2,300′ level, the water forked from this shaft going to a big precipitating plant in the gulch back of Meaderville. The pumping capacity of the plant is equal to raising 4,000 gallons of water per minute, from a depth of one half mile. The main shaft of the Diamond is about 2,000′ deep, and employs about 300 men, normally. The Mountain Consolidated has a 2,100′ main shaft and employs 150 to 300 men. The Green Mountain has a 2,200′ three-compartment shaft and employs about 200 men. The Bell has an 1,800′ main shaft and employs 300 to 500 men when fully working. The Buffalo employs a small force only. The Modoc, not working, has millions of tons of low-grade ore, running 1% to 1.5% in copper, which cannot be worked profitably under present conditions. But little sinking has been done in the deeper mines of the Anaconda for several years past.

Electric power is used extensively. The generating plant is at Canyon Ferry, 70 miles distant, and the current is wired to the mine with a primary voltage of 50,000, reduced to 2,000 volts at the transformer station, just outside of Butte, power being distributed to the various shafts and buildings from a main station at the Never Sweat. The principal dynamo is of 800 h. p., and drives a large duplex air-compressor. A three-phase dynamo, driven by the Canyon City current furnishes the motive power for a direct-current generator that replaced an extensive underground haulage plant actuated by compressed air. Many electric lights are also used underground, being employed wherever possible. A large number of minor motors at the various buildings of the surface plant are driven electrically, using a 440-volt current.

Although title to the reduction plant stands in the name of the Washoe Copper Co., it is described at considerable length in this article on the Anaconda, because it treats mainly Anaconda ores and is commonly known as the Anaconda smelter. This monstrous plant, which has no peer in the world, occupies a site of 300 acres on Washoe Heights, in the outskirts of the city of Anaconda, 35 miles by rail from the mines, and was planned by Frank Klepetko, and built and equipped with the able assistance of Messrs. Repath, Collins, Gulberg, and the late Wm. F. Evans. The plant began operations in January, 1902, and has a maximum capacity of about 6,000 tons daily.

The monstrous size of this reduction plant is shown by the material required in its construction, this including 20,000 tons of structural steel, 50,000 cubic yards of masonry, 25,000,000 feet of lumber and 1,000 carloads of brick, and requiring 300,000 cubic yards of excavation.

The concentrator covers 7 acres and is built on stone foundations, in two parts, each 255x355′, connected by a power-house between. Each part contains 4 complete sections, and a description of one section gives a description of the entire concentrating plant, when multiplied by eight. Each section has one 24x24″ Blake crusher, reducing ore to 3″ size, this passing over two sets of trommels for sizing, oversize material going through two 5x15″ crushers, which reduce it to 1½″ size. Two belt elevators take the material on the main sizing-floor to a series of trommels for coarse-sizing, oversize going to coarse jigs, which produce coarse concentrates for the blast-furnaces. The waste from the coarse jigs goes to two sets of 15x40″ rolls for crushing, and is thence elevated and rejigged. In the jigging department all undersize material from the crushers is treated automatically. Each jigging section has 36 double Evans jigs, set in three double rows, with Evans hydraulic classifiers, making three sizes of concentrates, which go to the storage bins, while the middlings go to the middlings department, which has two sets of 15x40″ rolls, crushing material to about 1¼″ size, which goes by belt elevators to 4 sets of trommels, from which the undersize goes automatically to 4 hydraulic classifiers which feed 18 double Evans jigs, set in a triple row. The process is the same as in the jigging department and the concentrates from the middling department are mixed with the concentrates from the jigging department and go thence to storage bins. The middlings are collected in launders and taken by elevators to the regrinding department, which has four 5′ Huntington mills, 18 double Evans jigs and 4 hydraulic classifiers. The Huntington mills are fed from V-shaped tanks, the ground material passing through 1¼″ screens to hydraulic classifiers, thence to the jigs, both concentrates and tailings being carried by water in launders and elevators. The slimes department has 35 Wilfley tables, fed from the bottom of V-shaped tanks, concentrates going to storage bins, 24x650′ and 70′ high, in two sets of upper and lower bins. The Anaconda's concentrating ore carries an average of 4% copper, 1 oz. to 6 oz. silver and 0.01 oz. to 0.02

oz. gold, 16% iron oxide, 17% sulphur and 55% silica. The tailings carry an average of 0.8% copper and 90% silica.

The sampling mills, 42x60′ and 5 stories high, are of brick and wood, in 2 double sections with a daily capacity of 600 tons each, equipped with Brunton samplers giving a final sampling of 3.2 pounds from each short ton of ore.

The roasting department is of steel, on stone foundations, 98x320′, with a height of 50′ from ground floor to calcining floor. This building contains 48 McDougal calcining furnaces, each 28′ high and with 6 roasting hearths and 3 platforms, hopper-cars delivering concentrates to hoppers with automatic feeds, each roaster having a daily capacity of about 40 tons. No coke is required except for the preliminary heating, the sulphur furnishing all fuel required after the charge is thoroughly ignited. Each furnace has an automatic discharge into two storage hoppers, these keeping the calcined ores hot until taken out to reverberatory furnaces. The building has sheet iron flues that take the fumes into a dust-chamber 40x300′ and 40′ high, this having concrete inner walls and a floor of steel hoppers.

The smelter formerly discharged into the air about 2 tons of arsenic and scores of tons of sulphur daily, causing enormous damage to the ranchers in the Deer Lodge valley. The Anaconda company paid damages exceeding $150,000 in settling 130 cases, and to obviate depopulating this fertile valley erected a new flue and smokestack in 1903. This stack is 300′ high, with an inside diameter of 33′ 2″ at the bottom and 30′ at the top, built of 3,000,000 brick, and 4′ 6″ thick at the bottom. Connecting the smelter and stack is a flue 60′ wide and 30′ high, 2,170′ in length, and 5,500′ long with connections, under which is a tunnel 7′ high and 55′ wide.

The power-house of the concentrator plant, 136x150′, standing between and connecting the two halves of the concentrator building proper, is of steel, with brick walls, having three 15-ton traveling cranes of 44′ span and contains a 1,500-h. p. Allis-Chalmers engine and two triple expansion 2,000-h. p. Nordberg engines, the latter using rope transmission. The boiler-room contains ten 300-h. p. Stirling water-tube boilers. The electric machinery consists of two 700-kilowatt 2-phase Westinghouse generators, one 500-kilowatt generator and three 125-arc-light generators, the latter furnishing light for the city of Anaconda as well as for the plant.

The reverberatory furnace building is of steel, 184x518′, and contains 14 furnaces, each 24x54′, set in two rows. Each furnace, of 120 tons daily capacity, has five charging-hoppers and one coal-hopper, fed from hopper-cars, the feeding of both fuel and calcined ore being strictly automatic. The matte is drawn off into 20-ton ladle cars and taken to the converter. The slag is skimmed into boxes overflowing into running water, and the granulated slag is washed through launders to the slag-dump. Fumes from the reverberatories are taken through underground flues, one for each row of furnaces, to the main flue.

The blast furnace department is a 3-story steel building, 82x200′, the first floor carrying the railroad tracks, while the second story is the main operating floor, and the third is the charging floor. There are five furnaces each 56x180″ and 40′ high, with a daily capacity of 400 tons each. Cupolas are made of cast-iron plates, bolted, with 12 special water-jackets hung from steel beams, each furnace having 32 five-inch tuyeres. The charging floor has railroad tracks on each side of the furnaces, side-dumping hopper-cars being handled by compressed-air locomotives. The charging doors of the furnace extend full length, and are opened and closed by compressed-air pistons, and all charges fed automatically. In front of each furnace is a 16′ settler, receiving a continuous flow of molten matte and slag, the matte being drawn from the bottom into 20-ton ladle cars, and taken thence to the converters. The slag overflows into sluices and after granulation by water is washed to the slag dumps. Overhead sheet-iron flues carry off fumes and smoke into a dust-chamber which is an exact duplicate of that in the calcining department. The product of the first fusion is a 44% matte, and the slags carry an average of 0.2% copper only.

The converter building is 137x416′, of steel, with two 60-ton electric traveling cranes of 60′ span each, for handling converters and ladles, and two smaller electric traveling cranes for the converting and casting departments. There are 2 reverberatory storage furnaces for the receipt of matte from blast furnaces, these being available for smelting, if desired. There are 8 stands of converters, each converter being 8′ in diameter and 13′ long, with eighteen 1¼″ tuyeres and ball-closing valves. There are devices for tilting the shells in stands, and cranes for handling them when out of stands. The converters blow off into hoods with flues leading to a dust-chamber similar to those already described. The matte is blown up to low-grade blister copper, and poured into ladles carried by cranes to three 70-ton casting-furnaces, which turn out anodes assaying about 97% copper and 80 oz. silver per ton. The anode moulds are on traveling carriages actuated by hydraulic power, pigs going automatically to water-cooling tanks, while the slag goes to a casting machine and is made into slag-brick. The lining department has a full outfit of machinery, largely automatic, for mixing linings for the converters, and these linings are tamped into place by ingenious machinery especially devised for the purpose.

The power-house of the smelting department, 80x500′, of steel and brick, has a 15-ton electric traveling crane of 500′ reach. The boiler-house has eighteen 300-h. p. Stirling boilers. There is a Nordberg triple expansion engine with capacify to compress 20,000 cubic feet of free air per minute to a pressure of 13 pounds per square inch, also 4 Nordberg compound engines direct-connected with Connersville blowers having capacity to compress 30,000 cubic feet of free air per minute, delivered to the blast furnaces at a pressure of 2 pounds per square inch. There are also 3 smaller compressors, for locomotives and air lifts.

The briquetting department has 2 machines of 100 tons daily capacity each, with dryers and conveyers. After briquetting, the flue-dust goes to the smelter for reduction. The blister copper is refined electrolytically, producing electrolytic copper assaying 99.5% copper, with traces only of arsenic and antimony. The Washoe smelter, when fully operated, employs about 1,800 men.

The Anaconda company operates a coal mine at Belt, Cascade county, Montana, F. W. C. Whyte, superintendent, which employs about 300 men. The company also owns a controlling interest in the Butte, Anaconda & Pacific Railroad, 35 miles in length, and operates a sawmill and other extensive enterprises, subsidiary to the mining and smelting of copper. Production of refined copper for the year ending June 1, 1903, was about 93,500,000 pounds, produced at a cost of 13.9 cents per pound, with gold and silver values net, or at a cost of 11 cents per pound, deducting gold and silver values. For the calendar year 1903 the mine made about 85,000,000 pounds of copper, the decreased production being due to about three months' idleness caused by litigation and the necessity of building the new flue and smokestack at the smelter. The Anaconda has been for some years the largest copper producer of the world, and is also the second largest producer of silver, incidentally producing more gold than any but the world's greatest gold mines, but the mine is deep and its ores are of low grade, the profits being very small in comparison with the production.

ANACONDA MINING CO. MONTANA.

Predecessor of the Anaconda Copper Mining Co., and still in existence.

ANACONDA PROPRIETARY COPPER, GOLD & SILVER MINE. AUSTRALIA.

Mine office: Condobolin, Cunningham Co., N. S. W., Australia. Capitalization £35,000, shares 10s. par. Opened 1885 and was formerly known as the Boone West. Ore traverses country rocks of ferruginous slate and brecciated conglomerate, copper carbonates outcropping sparingly in conglomerate. Has a small smelter.

ANDERSON GROUP. CALIFORNIA.

In Riverside county, California. Anderson & Co., owners. A group of 26 claims, with vein 2′ to 6′ wide, carrying agentiferous copper ore.

ANDERSON MINING CO. BRITISH COLUMBIA.

Mine office: Alberni, Vancouver Island, B. C. J. C. Anderson, president. Has steam power and limited mining development.

ANDES COPPER MINING & EXPLORATION CO., LTD. CHILE.

Offices: 4, Sun Court, Cornhill, London, E. C., Eng. W. B. Brodrick, chairman; F. J. Searle, secretary. Capital, nominal, £90,000; issued, £3,357. Has mining lands in Tarapaca, Chile.

SOCIEDAD BENEFICIADORA DE MINERALES ANDINA. PERU.

Mine office: Rumi-Cruz-Chico, Yauli, Peru. Has silver-copper ores.

ANDREWS GROUP. ARIZONA.

Mine office: Stoddard, Yavapai Co., Ariz. J. J. Canovan, owner.

ANDUEZA MINE. ARGENTINA.

Mine office: Chilecito, Rioja, Argentina. Is a small producer of ores averaging 5% to 7% copper, 30 oz. silver and 2 oz. gold per ton.

ANGANG COPPER CO. MEXICO.

Mine office: Chiranganguco, Zitacuaro, Michoacan, Mexico. Stock issue supposedly owned by Arimex Copper Co. Has a large body of medium-g chalcopyrite, with a limited amount of development, and has been opera on a very small scale for the past two years.

ANGEL MINING CO. ARIZO

Supposed to have copper claims in the vicinity of Wickenburg, M copa county, Arizona.

ANGLO-AMERICAN COPPER MINING COMPANY OF PARRY SOUND, LTD. ONTAR

Office: 211 State St., Chicago, Ill. Mine office: Parry Sound, Ont Organized 1900, under laws of Ontario, with capitalization $3,000,000, sh $1 par. Isaac Block, president; Jacob Newman, Jr., secretary and treas Lands are on Wilcox Island, near Parry Sound, showing veins carrying cop silver, gold, cobalt and zinc. Company estimates average ore values at copper and 10 oz. gold per ton, which is manifestly improbable. Has shaft, 125′ deep. Mine could be operated open-cast to advantage. O refractory and property idle at last accounts.

ANGLO-AMERICAN GOLD & COPPER CO. MEXI

Office and mine: La Cananea, Sonora, Mex. Organized under law Arizona and protocolized in Mexico, with capitalization $4,000,000, sh $10 par. W. H. Frost, president and general manager; A. F. Krohn, se tary; A. W. Arbuckle, manager. Lands, 360 pertenencias, area nearly acres, in two groups. The Graciela group of 200 pertenencias, 28 miles so of Cananea, gives average assays of 15.5% copper, 36 oz. silver and $ gold per ton. The Enriquito group of 160 pertenencias is 6 miles sout Cananea, apparently an extension of the Capote ore body of the Greene C solidated, and shows ores assaying 17% to 30% copper.

ANGLO-AMERICAN GOLD & COPPER MINING CO.

Office: care of A. B. Wadleigh, secretary, Naco, Ariz.

ANGLO-CHILE CONCESSIONS, LTD. CHI

Offices: 58, Lombard St., London, E. C., Eng. Geo. Flamank, secret Capital, nominal, £15,000. Supposed to have mining concessions in C

ANGLO-ITALIAN COPPER SYNDICATE. ITA

Said to have acquired 12,000 acres of copper bearing land near Ge Italy.

ANGLO-ROUMANIAN FINANCE & TRADING CO., LTD. ROUMA

Offices: 31, Walbrook, London, E. C., Eng. Mine office: Baia Ar Mehedintze district, Roumania. C. S. Matz, secretary. Capital, iss £449,112. Lands, 20,000 acres, including copper properties and for held on 35-year lease from October, 1898.

ANGUS COPPER MINING & MILLING CO.

Office: 10 North Eighth St., St. Louis, Mo. Gives no reply to repe requests for information. Location of lands, if any, unknown.

ANI GROUP. JAP

Owned and operated by Furukawa Copper Co.

MINA LAS ANIMAS. MEXI

Office: care of P. Sandoval y Ca., Nogales, Sonora, Mex. Mine off existing methods of smelting, but its utility remains to be demonstrated by something more trying than laboratory tests.

ANNA MINE. **ARIZONA.**

Mine office: Providence, Yavapai Co., Ariz. Supposed to be owned by Fairbanks, Morse & Co. Jas. Gillespie, superintendent, at last accounts. Has steam power and 15-stamp mill.

ANNANDALE MINE. **AUSTRALIA.**

Operated by Blayney Mining & Smelting Company.

ANNIE MINE. **WYOMING.**

Mine office: Jelm, Albany Co., Wyo. C. W. Brammel, superintendent.

COMPANIA COBRE DEL ANTOFOGASTA DE SANTIAGO DE CHILE. **CHILE.**

Mine office: Chuquicamata, Antofagasta, Chile. Alexander Muirhead, general manager. Capital, $325,000. Company controls about 30 old mines in this district, and is to have a modern smelter to handle the production.

AO MINE. **NEW CALEDONIA.**

Owned and operated by the Caledonia Copper Co., Ltd.

APACHE MINE. **NEW MEXICO.**

Mine office: Spear, Grant Co., N. M. Robt. Anderson, supt.

APACHE & MULTNOMAH MINES. **WASHINGTON.**

Mine office: Nespelim, Wash. F. O. Hudnut, superintendent. Ores carry gold, silver, copper and lead.

APEX COPPER CO. **COLORADO.**

Office; care of John K. Vanatta, president and treasurer, Colorado Springs, Colo. Mine office: Conrad, Park Co., Colo. J. J. O'Driscoll, vice-president and general manager; M. C. Meek, secretary. Organized March, 1903, under laws of Colorado, with capitalization $1,000,000, shares $1 par. Formation is granite and schists, showing carbonate and sulphide ores opened by 4 shafts, deepest 210′. Has steam power and purposes continuing sinking during 1904.

APEX MINING CO. **WASHINGTON.**

Office: 22 Sullivan Blk., Seattle, Wash. Mine office: Skykomish, Snohomish Co., Wash. Abner Griffin, president and general manager. Lands, 10 claims, 6 miles from Berlin, opened by tunnel showing a fair sized ore body giving good assays in copper, gold and silver.

APPOLO CONSOLIDATED GOLD MINING CO. **WASHINGTON.**

Office: New Haven, Conn. Mine office: Republic, Ferry Co., Wash. E. J. Delbridge, general manager. Ores carry gold, silver, lead and copper. Has steam power and employs about 20 men.

APOLLO COPPER MINING & SMELTING CO. **UTAH.**

Office and mine: Frisco, Beaver Co., Utah. Organized 1902, under laws of Utah, with capitalization $40,000, shares 10c. par. Geo. A. Gilbert, president; Matilda Olsen, secretary and treasurer.

NESTOR ARAIZA. **MEXICO.**

Office: Tepezalá, Aguascalientes, Mexico. Said to be operating copper properties in that vicinity.

ARAKAWA MINE. **JAPAN.**

Mine office: Arakawa-mura, Senboku-gun, Ugo Province, Japan. Was formerly known as the Ugaizawa mine. Opened [illegible], reopened [illegible]; owned by the Mitsu Bishi Goshi Kwaisha since 1896. The country rocks are of Tertiary and Quaternary ages, including hornblende-andesite, liparite and propylite. Numerous parallel veins are found in the propylite and Tertiary strata, with strike approximately N. E. and S. W. There are six important veins, of which the Ugaizawa-ohi is the principal, this having a strike of North 30° to 40° East, with a general dip of 60° N. W., sometimes approaching the vertical. This vein averages 24' in width, carrying one-quarter to one third ore. Other veins range 5' to 7' wide. Ore is chiefly chalcopyrite with occasional native copper, cuprite and chrysocolla, and is associated with galena, sphalerite and iron pyrites. Output of refined copper for 1900 was 1,734,522 lbs.

ARAMO COPPER MINES, LTD. **SPAIN.**

Offices: 2, Metal Exchange Bldgs., London, E. C., Eng. Mine office: Pola de Lena, Asturias, Spain. C. W. Aston Key, secretary. Capital, £40,000. Property is the Aramo copper and cobalt mines.

ARCADIAN COPPER CO. **MICHIGAN.**

Office: 24 West St., Boston, Mass. Mine office: Arcadian, Houghton Co., Mich. Albert. C. Burrage, president; Chas. D. Burrage, secretary and treasurer; Nathan F. Leopold, general manager; Robt. H. Shields, agent. Organized March 31, 1899, under laws of New Jersey, with capitalization $3,750,000, shares $25 par. Lands, about 4,000 acres, including 6 old mines. Was extensively opened 1898-1901, and equipped with magnificent buildings and machinery, including a 3-stamp mill at Grosse Pointe. Operations proving unsatisfactory, all work was suspended early in 1903. Hoists, machinery and shaft houses were sold to the Trimountain, and dwellings are now being removed. Mill has been sold to Centennial. Financial statement not obtainable, but company supposed to have a large floating indebtedness.

ARDILLA COPPER MINES, LTD. **PORTUGAL.**

Offices: 20-21, Lawrence Lane, London, E. C., Eng. Mine office: Barrancos, Alemtejo, Portugal. Maj. Henry Slane Fleming, chairman; A. L. Pulido, mine manager; Wm. Cooper, secretary. Capital, nominal, £120,000; issued, £108,080. Lands, 11 concessions, area 1,331, acres, on the Ardilla river.

ARENILLAS COPPER MINES, LTD. **SPAIN.**

Offices: 7, Laurence Pountney Hill, London, E. C., Eng. Registered Jan. 9, 1903, with authorized capital £255,000, to acquire Spanish mines.

ARGHANA MADEN MINES. **TURKEY.**

Located near the town of Arghana Maden, Turkey, and owned by the crown. Mines about 7,000 tons of ore yearly, making therefrom about 2,500 metric tons of fine copper, shipped as an 80% matte. Ores are said to be of exceptional richness, and mines capable of considerable production if given modern plant and methods.

ARGO COPPER MINING CO. **MONTANA.**

Office: care of Canol & Martin, Helena, Mont. Property is near Canyon Ferry, Lewis & Clarke Co., Mont. H. W. Canol, superintendent. Has a concentrator and ships 25% copper concentrates to the National smelter, at Rapid City, S. D. Ore is high grade, with iron gangue, carrying small gold values.

ARGO MINING, DRAINAGE, TRANSPORTATION & TUNNEL CO. **COLORADO.**

Office: Idaho Springs, Clear Creek Co., Colo. Lafayette Hanchett, superintendent. Ores carry gold, silver, lead and copper. Has steam and electric power.

ARGYLE MINING CO., LTD. **ARIZONA.**

Offices: 194, St. Vincent St., Glasgow, Scotland. Mine office: Prescott, Yavapai Co., Ariz. A. Winchell, secretary; Dr. Theodore B. Comstock, general manager; W. C. Bashford, local agent. Capital, nominal, £100,000; issued, £65,007. Lands, 2 claims, near Huron, Yavapai county, assaying well in copper, gold and silver.

ARIMEX CONSOLIDATED COPPER CO. **ARIZONA & MEXICO.**

Office: 85 Ames Bldg., Boston, Mass. Organized under laws of New Jersey, with capitalization $5,000,000, shares $25 par. Chas. H. Dickey, president; C. D. Burrage, secretary. Property includes the Copper Prince group of 30 claims, in the Silver Bell district, Pima Co., Arizona, held through the Oxide Copper Co. Also owns seven-eighths of the stock of the Table Mountain Copper Co., which has 27 claims in the Bunker Hill mining district of Pinal Co., Arizona, and nine-tenths of the stock issue of the Angang Copper Co., which holds about 400 pertenencias, known as the Chirangangueo mines, near Zituacuaro, Michoacan, Mexico. Neither of the Arizona properties is of apparent value, but the Mexican claims are well regarded.

ARIZONA MINE. **WYOMING.**

Mine office: Hecla, Laramie Co., Wyo. Horace E. Adams, owner. Has steam power, 5-stamp mill and leaching plant, working on gold-copper ores.

ARIZONA MINING CO. **NEW MEXICO.**

Office: 311 Pozzoni Bldg., St. Louis, Mo. Mine office: Pinos Altos, Grant Co., N. M. F. Townsend, superintendent. Ores carry gold, silver and copper. Has gasoline power and employs about 25 men.

ARIZONA & ARKANSAS LEAD, ZINC & COPPER MINING CO. **ARIZONA & ARKANSAS.**

Office: 208 Tajo Bldg., Los Angeles, Cal. Mine office: Gila Bend, Maricopa Co., Ariz. B. E. Lower, president and general manager; Alex. C. Murphy, secretary; A. A. Kendrick, superintendent. Organized April, 1900, under laws of Arizona, with capitalization $1,000,000, shares $1 par. Lands 9 claims, in the Copper Zone Mountains, Eagle Tail district, 45 miles from Gila Bend, showing gold and copper ores. Also has lands in Baxter county, Arkansas, carrying lead, zinc and copper.

ARIZONA BLUE BELL COPPER CO. **ARIZONA.**

Office: 71 Broadway, New York. Mine office: Mayer, Yavapai Co., Ariz. Organized under laws of Delaware, with capitalization $500,000, shares $1 par. C. A. Hamilton, president; M. L. Bouden, secretary and treasurer; Ernest A. Haggott, general manager. Lands, 22 claims, area 440 acres, also 320 acres miscellaneous lands, in the Big Bug district. Veins are fissures in Algonkian slates, with quartzite footwall and grano-diorite hanging. Has 3 veins, developed by 6 shafts, deepest 300′, and tunnels of 70′ and 75′, giving assays of 5.85% copper, 2.35 oz. silver and 0.15 oz. gold per ton, from cuprite, malachite and chalcopyrite. Estimated by company to have 200,000 tons of ore blocked out, and is said to have an immense ore body on the 300′ level.

ARIZONA CENTRAL COPPER CO. ARIZONA.

Office: Prescott, Ariz. Mine office: Williams, Coconino Co., Ariz. J. F. Wilson, president; J. M. Elder, secretary; M. Salzman, superintendent.

ARIZONA-COLORADO COPPER BELT & GOLD MINING & MILLING CO. ARIZONA.

Office: 248 Equitable Bldg., Denver, Colo. Mine office: Globe, Gila Co., Ariz. Employs 10 men. Hon. R. L. Foree, president and general manager; Frank A. Wright, vice-president; Jos. D. Whitham, secretary and treasurer; Dayton B. Whitham, superintendent and engineer. Organized September, 1901, under laws of Arizona, with capitalization $2,500,000, shares $1 par. Lands, 18 claims, area 370 acres, showing veins ranging from 3′ to 100′ in width, carrying auriferous and argentiferous oxide and carbonate ores of copper assaying 8% to 30% copper, 20% to 50% lead, 1 oz. to 200 oz. silver and $3 to $30 gold per ton. Has 7 pits and shafts, deepest 165′, also several tunnels from 10′ to 200′ in length. Has 100-h. p. steam equipment and will continue sinking 2-compartment main shaft in 1904.

ARIZONA COMMERCIAL CO. ARIZONA.

Office: 11 Pine St., New York. Mine office: Globe, Gila Co., Ariz. Organized 1882, under laws of New York, capitalization doubled, November, 1903, to $2,000,000, shares $10 par. Sigourney W. Fay, president; J. H, Fay, secretary and treasurer; N. L. Amster, consulting engineer; W. S. Sultan, superintendent. Lands, 10 claims, just north of the Old Dominion mine. The Copper Hill claim has a 600′ shaft showing oxide and carbonate ores near surface, with an 8′ vein of medium-grade chalcopyrite on 6th level at bottom of shaft, estimated to show 200,000 tons of 6% ore.

ARIZONA CONSOLIDATED COPPER MINES, LTD. ARIZONA.

Offices: 80, Coleman St., London, E. C., Eng. Capital, £7.

ARIZONA COPPER CO., LTD. ARIZONA.

Offices: 29, St. Andrews Sq., Edinburg, Scotland. Mine office: Clifton, Graham Co., Ariz. Employs about 2,000 men. Organized August 5, 1884, with capitalization £755,000, of which £736,504 is issued, in 160,000A 5s. preference shares, £316,530 fully paid preference shares, £316,530 fully paid preferred ordinary shares and £63,444 fully paid deferred shares. Profits are divided as follows: 10% cumulative dividends on A preference shares; cumulative 7% dividends on preference shares; 10% non-cumulative dividends on preferred ordinary shares; 10% non-cumulative dividends on deferred ordinary shares; balance, if any, to be divided pro rata between preferred ordinary and deferred ordinary shares. Debentures, £169,570, at 5%. Fiscal year ends Sept. 30th. Company pays large dividends, having paid 5s. 6d. Feb. 25, 1903, on preferred and common stock, an interim dividend of same amount July 24, 1903 and regular dividend of same amount on Sept. 30, 1903. In addition to paying large dividends the company has expended about £560,000 in reconstruction of plant, railways, etc., during the past three years. Wm. John Menzies, W. S., chairman; Wm. Exley Miller, C. A., secretary; James Colquhoun, president; Alex. Veitch, general manager; Geo. Fraser, superintendent; Walter A. Moore, mill superintendent; A. T. Thompson, clerk.

Property is about 4,000 acres, including mines at Morenci, Metcalf, Longfellow, Garfield and Coronado, all in Graham county, Arizona, the principal mines being the Humboldt, at Morenci and the Longfellow, which was the first copper mine opened in Arizona. The ore occurs as disseminated sulphides, the Humboldt showing extensive deposits of low-grade disseminated chalcocite. Mines are worked open-cast and product is of two grades, about one-tenth being smelting ore and nine-tenths concentrating ore. For the year ending Sept. 30, 1902, the concentrating ores averaged 2.76% copper with an average of 3.37% for both grades. Average was somewhat lower during 1903. Ore is taken from the different mines over 6 gravity trams to storage bins on the Coronado railroad. A little oxide ore is furnished by the Metcalf mines and is concentrated with the sulphides from the Humboldt and Yavapai mines. The new plant is treating a lower average of concentrating ore than was formerly possible, the production of the mine being nearly 500,000 tons of ore yearly. Output of refined copper for 1903 was about 27,000,000 lbs.

The mines and works use about 2,700 h. p., supplied almost equally from gas, steam and gasoline or distillate engines. The company operates the Coronado railway, of standard guage for 4 miles from Clifton to Longfellow and of 36″ gauge 2.5 miles from Longfellow to Metcalf, also the Arizona & New Mexico railway, a standard gauge line running 107 miles from Clifton to Hachita, N. M., where connections are secured with the El Paso & Southwestern. The Coronado railway has 30-ton ore cars.

The new reduction plant at Clifton, remodeled in 1902, includes a concentrator, leaching plant, acid plant and smelter. The 4 concentrators at Clifton have a combined daily capacity of 1,100 tons and are operated by gas and electric power. There is also a 300-ton concentrator at Longfellow, taking power from three 110-h. p. Crossley gas engines. The acid plant makes about 14 tons of sulphuric acid daily from the fumes of the roasters, the entire product being used in the leaching plant, which is of about 250 tons daily capacity and leaches the copper values from low-grade oxide ores. In connection with this is a 125-ton bluestone plant.

The smelter is of steel frame, with slate roof and floor of iron plates laid in cement, well designed and thoroughly modern, having five 350-ton furnaces, with blast supplied by No. 7 and No. 9 Root blowers operated by a 270-h. p.

engine. Gases from the furnace pass through a 480′ tunnel and a 300′ shaft, discharging 300′ above the level of the town. Matte of 50% to 55% is charged into the converters by a 10-ton ladle operated by a 30-ton electric crane. The conversion plant has six 7-ton shells, with 3 stands having a daily capacity of 50 tons of 99.5% blister copper.

The new reduction plant at Clifton went into commission August 1, 1901. Concentrator and smelter are connected by a gravity railway. The company has a foundry, sawmill, planing mill and 20-ton ice plant, in addition to the usual machine shops, carpenter shops, smithy, car shops, roundhouses, etc., all built of brick. A good library and reading room is maintained for employes. This property, while of low grade, is one of the world's leading mines, and has been made such by exceptionally economical and capable management. With the immense ore bodies now opened, the present rate of production can be maintained indefinitely, and, if necessary, increased, though any increase would necessitate extensive additions to plant, requiring much time and heavy cash expenditures.

ARIZONA COPPER BUTTE MINING CO. ARIZONA.

Office: Minneapolis, Minn. Lands, if any, not located.

ARIZONA COPPER & GOLD MINING CO. ARIZONA.

Letter to company's address at Phoenix, Ariz., returned unclaimed. B. F. Porter, president, and A. W. Gregg, secretary, at last accounts.

ARIZONA COPPER HILL MINING CO. ARIZONA.

Office: Jackson Bldg., Denver, Colo. Mine office: Tucson, Pima Co., Ariz. Organized 1900, under laws of Arizona, with capitalization $1,000,000, shares $1 par. Edwin Scott, president; J. H. Edwards, secretary. Frank J Buck, superintendent. Lands, 4 patented claims, area 65 acres, also 5-acre millsite and 160 acres miscellaneous lands, in the Canada del Oro district, showing a contact vein of 20′ to 70′ width and 4,817′ length, giving estimated average values of 4% copper from carbonate ores. Is opened by shafts of 281′ and 350′ and a 350′ tunnel, with about 2,000′ of underground openings, showing considerable ore. Has steam and gasoline power and 100-ton cyanide plant, employing about 15 men.

ARIZONA COPPER MOUNTAIN MINING CO. ARIZONA.

Office: 116 Nassau St., New York. Local office: Phoenix, Ariz. Organized 1900, under laws of Arizona, with capitalization $6,000,000, shares $1 par. Augustus C. Sheldon, president and general manager; Benj. C Sheldon, secretary; Allen G. Wilson, superintendent. Lands, 20 claims, area 400 acres, also 40-acre millsite, in the Mineral Creek district, 5 miles west of Ray, Pinal county, Arizona. Has a blanket vein claimed to be 1,200′ wide and 4,000′ long, opened to depth of 200′, showing oxide, carbonate and sulphide ores, estimated to give average values of 8% copper, opened by 4 tunnels, longest 300′, and 20 pits and shafts, deepest 200′. Property undoubtedly has a very large ore body, perhaps fairly estimated at 4,000,000 tons, but the estimates of average ore values are much too high.

ARIZONA COPPER PLACER MINING & MILLING CO. ARIZONA.

Said to be operating near Quartzite, Yuma county, Arizona.

ARIZONA COPPER SYNDICATE.

Former office, 32 Broadway, New York. Dead.

ARIZONA COPPER SYNDICATE, LTD. **ARIZONA.**

Moribund.

ARIZONA, EASTERN & MONTANA SMELTING & ORE PURCHASING CO. **MONTANA.**

Company apparently organized solely to sell stock. Dr. R. C. Flower, well known to the courts, was a promoter.

ARIZONA GIANT COPPER CO. **ARIZONA.**

Office: 229 Byrne Bldg., Los Angeles, Cal. Mine office: Ehrenburg, Yuma Co., Ariz. R. M. Furlong, president; H. Franklyn Hiller, secretary and treasurer. Capitalization $3,000,000, shares $1 par. Lands 320 acres. Old management which sold considerable stock at fancy prices, was ousted September, 1903. Former officers have withheld books and present management is suing old officials for an accounting.

ARIZONA GOLD & COPPER CO. **ARIZONA.**

Office: 30 Broad St., New York. Mine office: Patagonia, Santa Cruz Co., Ariz. Employs 25 to 30 men. Organized February, 1900, under laws of Arizona, with capitalization $1,000,000, shares $1 par. Debentures, $32,500 first-mortage 6% bonds, dated Feb. 1, 1902. Floyd B. Wilson, president; Frederick K. Jones, secretary; Col. Geo. W. Crowe, general manager; Harry L. Vaughn, superintendent. Lands, 7 claims, area 140 acres, in the Tyndall district of the Santa Rita mountains, including the Gaelic, Trenton and Salero mines, opened by 7 shafts and a tunnel, latter opening a 4′ vein said to average 3% copper, 15% to 20% lead and 10 oz. silver per ton. Has a 50-ton concentrator, built in 1903, and an 80-ton smelter at Patagonia.

ARIZONA GOLD & COPPER MINES CO. **ARIZONA.**

Office: 19 Park Row, New York. Mine office: Wickenburg, Maricopa Co., Ariz. Geo. A. Sanders, manager; A. A. Pratt, superintendent. Operates the Angel mine. Ores carry gold, and copper. Has gasoline power.

ARIZONA GOLD & COPPER REDUCTION CO.

An enterprise floated by Theodore Stegner, of Kansas City, Mo., a notorious promoter of worthless mining companies.

ARIZONA GOLD MINING & MILLING CO. **ARIZONA.**

Mine office: Briggs, Yavapai Co., Ariz. R. B. Large, manager. Claims include the Swallow mine, showing auriferous copper ores. Has gasoline power and 10-stamp mill. Letter returned unclaimed from Briggs, marked "out of business."

ARIZONA & HANCOCK MINING CO. **ARIZONA.**

Office: Hancock, Mich. Mine office: Globe, Gila Co., Ariz. Organized 1901, under laws of Arizona, with capitalization $250,000, shares $1 par, as the Pinto Creek Copper Co. John D. Cuddihy, president; Alfred C. Sieboth, vice-president and manager; Henry L. Baer, secretary and treasurer; John de Vote, superintendent. Lands, 19 claims, near Globe, opened by a 450′ shaft and 400′ crosscut, showing considerable bodies of 3% to 5% ores, too low in grade for working at present, and the main shaft shows stringers of rich ore on the 450′ level, and is expected to cut the Proctor lode at a depth of about 725′. Plans developing the high-grade ores only, shipping same to smelters. Has steam power and employs about 40 men. Nearest railway is 2 miles

ARIZONA-MEXICAN COPPER CO. **MEXICO.**

Office: Phoenix, Ariz. Mine office: Caborca, Sonora, Mex. Employs 22 men. J. E. Hubinger, president; W. E. Defty, vice-president and consulting engineer; W. C. Foster, treasurer; John Henderson, superintendent; J. C. Flores, mine foreman. Organized February 14, 1902, under laws of Arizona, with capitalization $3,000,000, shares $10 par; unissued, $920,000. Lands, 68 pertenencias, in the Altar district, 75 miles from the Sonora Railway. Country rock is granite, ores carrying an iron and spar gangue. Vein is 228′ wide giving average assays of 6.7%. copper, 12 oz. silver and $2 gold per ton, and is opened by shafts of 102′ and 200′, and tunnels of 209′ and 228′. Development work has been well planned and executed, every foot of opening being in the ore body. A winze from a 190′ drift is following the footwall, entirely in ore, with druses of very rich carbonates. Company plans installing heavy hoisting machinery about February, 1904. Management is good and property gives every indication of making a large and successful mine.

ARIZONA-PACIFIC COPPER CO. **ARIZONA.**

Office: 702 Stevenson Bldg., Indianapolis, Ind. Mine office: Florence, Pinal Co., Ariz. Organized 1903, under laws of Arizona, with capitalization $5,000,000, shares $1 par. F. P. Jeffries, president; John W. Sharpe, vice-president; Murat W. Hopkins, secretary; S. C. Prunty, superintendent. Lands, 12 patented claims, area 240 acres, also an 80-acre smelter site and 160 acres of possible oil lands. Property shows sundry minor veins, assaying 3% to 20% copper and $5 to $20 gold per ton. A quartz-porphyry dyke, 1,200′ long and about 500′ in extreme width, with axes east and west, is shattered in every direction, and cemented by veins carrying cuprite, melaconite and chalcocite, giving estimated average values of 3% copper, 1 oz. silver and $2 gold per ton. Has two shafts, 600′ apart, also 2 tunnels at same distance. Resumed work December, 1903, and plans sinking the 2-compartment main shaft to depth of 500′. Has 2 gasoline hoists, air-compressor, power drills and necessary mine buildings. Officers of company are men of good standing and the property, though low in grade, is regarded as promising, owing to great size of the ore body.

ARIZONA UNITED COPPER CO. **ARIZONA.**

Office: 35 Wall St., New York. Edmund D. Willetts, president, at last accounts. Company apparently moribund.

ARIZONA & WEST LAKE COPPER CO. **ARIZONA.**

Office: Bisbee, Ariz. Organized 1903, under laws of Arizona, with capitalization $1,000,000. John M. Stanaway, president; J. J. McCarthy, superintendent. Lands, 18 claims, 3 miles northwest of Packard, Cochise county, Arizona. Is sinking a 2-compartment shaft, about 60′ deep at close of 1903.

ARLINGTON MINE. **WASHINGTON.**

Near Conconully, Okanogan Co., Wash. H. S. Stoolfire, owner. Ores carry gold, silver and copper. Has steam power. Letter returned unclaimed from Conconully.

ARLINGTON COPPER CO. **NEW JERSEY.**

Lands at Arlington, N. J., sold Sept. 30, 1903, for debt.

SUCESION FRANCISCO ARMANDAIZ. **MEXICO.**

Office: Apartado Postale 37, Monterey, N. L., Mex. Mine office: Cerralvo, Nuevo Leon, Mex. Ores carry silver, lead and copper. Employs 50 to 75 men.

ARMINIUS CHEMICAL CO. **VIRGINIA.**

Office: 56 Wall St., New York. Mine office: Mineral City, Louisa Co., Va. Rowland F. Hill, president; W. Maw, secretary; Alvin P. Maw, general manager. Mines cupriferous pyrites. Has steam power, and concentrator, working a considerable force.

ARMSTRONG MINE. **CALIFORNIA.**

Office: care of W. Roy, Merced, Cal. Property is a prospect in Indian Gulch, Mariposa county, California.

ARNOLD MINING CO. **MICHIGAN.**

Office: 50 State St., Boston, Mass. C. L. Davenport, president; John Brooks, secretary and treasurer; Wesley Clark, superintendent. Organized under Michigan laws, with capitalization $2,500,000, par $25; issued, $1,550,000. Annual meeting, second Tuesday in May. Property, 3,323 acres, in Town 58 North, Range 31 West, and Town 58 North, Range 30 West, Keweenaw county, Michigan. Lands are in two tracts, comprising the old Copper Falls mine and the Arnold mine proper, with frontage of about 3 miles on Lake Superior. Property lies north of the greenstone. Copper Falls mine worked, circa 1850 until August 1893, making 12,843 tons, 429 pounds fine copper, and paying dividends of $100,000. Product was secured mainly from the Owl Creek fissure vein. Arnold mine proper is developed on the Arnold ashbed; opened 1863, reopened 1897, closed 1901. Rock stamped averaged under 0.8% copper. Has stamp mill and 2½ mile narrow gauge railroad, known as Arnold & Eagle Harbor, rolling stock of which has been sold. No. 1 shaft of the Arnold is about 1,000′ deep, sunk at angle of 26° with the horizon.

ARPS CLAIMS. **CALIFORNIA.**

Fifteen claims, in Town 34 North, Range 3 West, Shasta county, California. Have 4 tunnels, aggregating 1,600′, with fair showing of sulphide ore. Letters addressed to putative owners returned unclaimed from Redding, Cal.

ARTOLA HERMANOS. **CHILE.**

Operate the Gatico mine, opened 1891, in department of Cobija, Chile. Product, shipped as matte, is equivalent to an annual output of 1,000 to 2,000 tons of refined copper.

ASCOT MINE. **QUEBEC.**

Mine office: Capelton, Sherbrooke Co., Que. Is developing.

ASHBED MINING CO. **MICHIGAN.**

Office: 50 State St., Boston, Mass. Organized 1880, under laws of Michigan, with capitalization $1,000,000. Wesley Clark, superintendent. Lands, 1,143 acres, in vicinity of Copper Falls, Keweenaw county, Michigan. Property idle. Fully described in Vol. II.

ASHIO MINE. **JAPAN.**

Owned and operated by Furukawa Copper Co.

ASHLAND MINING CO. **COLORADO.**

Mine office: Ohio, Gunnison Co., Colo. Carroll M. Carter, superintendent. Property is the Carter group, carrying gold, silver, lead, copper and zinc ores. Has steam power and employs about 20 men.

COMPANIA MINERA DE ASIENTOS. **MEXICO.**

Mine office: Asientos, Aguascalientes, Mex. Harry Rab, superintendent. Lands include the Nopensada mine, producing copper and silver. Main shaft 200′. Has steam and electric power and employs a considerable force.

SOCIETE CIVILE DES MINES DE CUIVRE D'ASPEICH. **FRANCE.**

Offices: 3, Rue de Milan, Paris, France. G. Caton, manager. Lands are in the Basses Pyrenees, France. Idle at last accounts.

ASTOR MINING CO. **COLORADO.**

Mine office: Eureka, San Juan Co., Colo. E. C. Condit, superintendent. Property includes the Surprise, Mogul and other claims, producing gold, silver, lead and copper. Has steam, water and electric power, and employs about 25 men.

SOCIEDAD INDUSTRIAL DE ATACAMA. **CHILE.**

Operates Tierra Amarilla mine, opened 1857, in department of Copiapo, Chile, also the Lautaro, Almalanos and other mines, producing copper, gold, silver and lead. Has an idle smelter at Caldera, Atacama, Chile, and secures an annual production of 1,000 to 2,000 tons fine copper, shipped in the form of bars and matte.

ATACAMA MINERAL CO., LTD. **CHILE.**

In voluntary liquidation. W. C. Nesbit, liquidator.

ATE MINE. **JAPAN.**

Mine office: Komatsu, Kaga, Japan. Works two main veins, in liparite and brecciated tufa, one being a fissure and one a contact vein. These veins cross, the intersection giving the richest ore. At a little distance from the point of intersection veins thin out and become of poor quality. Ore is chalcopyrite, with iron pyrites, showing bornite and tenorite in the upper portions, averaging about 10% copper. Production for 1900 was 231,484 lbs.

ATHELSTAN GOLD MINING CO., LTD. **BRITISH COLUMBIA.**

Mine office: Phoenix, Yale & Cariboo district, B. C. James Anderson, president; John Mack, vice-president; and manager; W. J. Morrison, secretary and treasurer; David Oxley, superintendent. Capitalization is $50,000. Ore is cupriferous, auriferous, and argentiferous arsenopyrite. Resumed work June, 1903, after several years' idleness.

ATLANTIC MINING COMPANY. **MICHIGAN.**

Office: 11-13 William St., New York. Mine office: Atlantic Mine, Houghton Co., Mich. Employs about 700 men. Organized December, 1872, under laws of Michigan; reincorporated 1901, for term of 30 years, and capitalization increased 1902 to $2,500,000, shares $25 par, $9.80 paid in. Annual meeting, second Tuesday in March. Jos. E. Gay, president; John Stanton, secretary and treasurer; preceding officers, John R. Stanton, Wm. C. Stuart, J. Wheeler Hardley, Wm. A. Paine and Samuel L. Smith directors; Frank McM. Stanton, agent; Theodore Dengler, superintendent; F. G. Coggin, mill superintendent; John Stratton, mining captain; A. D. Edwards, clerk; John Grigg, master mechanic.

Official returns to the state of Michigan, as of date Jan. 1, 1903, disclose the following figures:

Amount of cash paid in on capital stock	$280,000.00
Amount paid in by conveyance of property to company	700,000.00
Entire amount invested in real estate	45,349.56
Amount of personal estate	306,756.05

Comparative figures for four years are as follows:

	1902.	1901.	1900.	1899.
Mineral produced, lbs	6,847,270	6,317,645	6,577,955	6,147,555
Refined copper, lbs	4,949,366	4,666,889	4,930,149	4,675,882
Total income	$ 588,200	$ 735,577	$ 800,177	$ 802,804
Expenses at mine	535,956	573,341	555,254	508,148
Smelting and transp'n	62,954	62,954	60,311	63,009
Total cost	598,910	636,296	615,556	573,027
Mining profits	......	99,281	193,621	229,777
Land sales	47,788	11,600	......	......
Construction	38,676	191,143	114,007	78,527
Balance	—1,598	—80,262	+79,613	+151,250
Dividends	....	....	80,000	80,000
Surplus	94,101	95,699	175,962	176,348

The Atlantic mine is located about 2 miles south of Portage Lake and 4 miles southwest of Houghton, the main tract of 640 acres including the mines known as the South Pewabic and Adams before 1872. The Atlantic has the Pacific on the north; Isle Royale and undeveloped lands on the east and south, and the Pacific and St. Mary's Mineral Land Co. on the west. The Atlantic lands are all on the mineral belt, being the south half of Section 4, except the southeast quarter of the southeast quarter; the north half of Section 9, and the northwest quarter of the northwest quarter of Section 10, all in Town 54 North, Range 34 West. The company also owns all of Section 16, same town and range, bought in 1897, on which crosscuts have been sent east and west, in search of the Baltic amygdaloid, without success, work having been discontinued in August, 1903. The breast of the north drift of No. 5 Baltic shaft is little more than 2,000′ distant from Section 16. The company also owns several thousand acres of timber lands, a millsite on Lake Superior and valuable frontage on Portage Lake.

The mine is opened on an amygdaloid bed of brownish, mottled color averaging about 15′ width, with strike of N. 50° E., and dip of 54° to 55°

orthwest. The lode is the most westerly worked in Houghton county, is known locally as an ashbed, greatly resembling the ashbed of the ld and adjacent mines, and being in line with the probable southwest continuation of the Keweenaw county ashbed. The Atlantic ashbed ies the least copper of any lode now worked successfully, and has long famous for its profits, wrung from rock yielding much less than 1% copper. The low percentage of copper carried by the lode is a decidedly rse factor, but the mine, under its present management, has met and ived many adverse factors, including lean rock, mine fires, costly equipnt necessitated by deepening shafts, installation of new machinery, conction of a new mill, and the building of a private railroad required for traffic of the mine. Among other disadvantages are a wet mine, causing vy pumping charges, and a treacherous hanging wall, necessitating the viest timbering used in any amygdaloid mine of the Lake Superior dist. To offset all this are certain marked advantages. The ashbed is the test rock mined in the district, requiring less power in drilling, less dynate in breaking, and less steam in stamping, than any other lode, and breaks ll, while everything is mined from wall to wall. The best of the lode is low in copper that no assorting is attempted. The property has an able d economical management, and is often quoted by mining men and the chnical press as the finest example extant of a successful low-grade mine.

The six shafts are lettered in order from north to south. "A" shaft, e northernmost, opened in 1897 to develop newly purchased ground, is nk at an angle of 54°, one degree flatter than the other shafts, and is the gest in dimensions of any, being 9x20' inside of timbers, with three comrtments, two of which are skipways, the third for men and pipes. Surface provements, completed in 1899, consist of a wooden shaft-rockhouse, x67' on the ground and 84' high, with four rock-crushers. There is a x50' boiler-house with redstone walls and steel truss roof, and a 45x50' gine-house of the same construction, containing a 20x48" double Corliss gine of Allis-Chalmers make, so built that it can be compounded later, desired. Hoisting is done over a double conical drum of 10' diameter at ther end and 15' 6" in the center, raising 9-ton skips. The shaft is in lean ound, especially in the north drifts, and when the stopes now opened are orked out, in a year or two, the shaft may be closed, and payable openings ade tributary to "B" shaft, which is 1,377' southwest of "A" with 2 comrtments, both having skip-tracks. This shaft is to the 26th level at the se of 1903, showing good copper ground. "B" shaft has a fine surface nt, with double conical drum Corliss hoist of Allis-Chalmers make, similar design to the plant at "A" shaft, but much larger throughout, the drum ing 12' at each end and 24' 4" in diameter at the middle where there is a lindrical section 18" wide, thence tapering sharply in both directions. The m has a 22' face and weighs 140 tons, all grooves being lathe-turned for " steel cable. The hoist is operated in counterbalance and is good for lepth of 4,000', 11-ton skips being raised at a speed of 3,000' per minute perates at a steam pressure of 100 pounds to the inch, and is direct-acting and non-condensing, with band brakes at either end, set by gravity and instantaneously released by steam power.

"C" shaft, next southwest, was abandoned after the fire of 1898.

"D" shaft, 1,465′ southwest of "B", is the deepest and best shaft of the mine, 9x18′ in size inside of timbers, with three compartments, two for skips worked in balance. The engine-house is 48x60′, of redstone with steel truss roof, housing a Nordberg hoist working in balance and calculated to hoist six-ton skips from one mile depth. The boiler-house has four 150-h. p. Stirling boilers. This shaft is looking well and gives promise of good rock for the future, as it commands a large territory, and the bottom levels are the richest, and must furnish the bulk of the Atlantic's future production.

"E" shaft, 2,440′ deep, is used for a man-way and pipes only.

"F" shaft is 478′ southwest of "D" and was long a large producer. It was 2,146′ deep when put out of commission in 1902.

The mine's equipment includes a 50-drill Ingersoll-Sergeant air compressor, machine, carpenter and blacksmith shops, and a sawmill. The principal buildings have fire pumps and there is an efficient volunteer fire brigade. The village dependent on the mine has about 500 dwellings, half owned by the company, with several churches and one of the best graded schools in the state.

The Atlantic railroad, owned by the company, connects mine and mill with 9 miles of main line, and a 3-mile branch line runs from the mine to the old millsite on Portage Lake, where there are large coal and merchandise wharves for receipt of fuel and supplies. The railroad has 4 Baldwin and 1 Brooks locomotives, 130 hopper cars for rock and coal, and 60 flat cars, for wood and general freight. The mine is on the main line of the Copper Range railroad.

The stampmill, built 1894-95, is at Redridge, on Lake Superior, having nearly 2 miles of water frontage, and is 151x234′ in size, of wood on stone foundations. Water is furnished from a dam, described in the article on Baltic. The mill has 6 stamps with 18″ cylinders, of about 350 tons daily capacity each. Chilean regrinding mills are used for the raggings. Power is supplied by a 14x42″ Reynolds engine of Corliss pattern. There are 7x14x12″ Gardner fire pumps in the mill and boiler-house adjoining. A machine shop in the mill is supplied with all tools required for repair work and fitting. Adjoining the mill is the boiler-house, of wood, on stone walls, 71x101′ in size. A Green fuel economizer, added in 1899, saves about 12% in coal bills. At the millsite there is a 30x36′ frame warehouse, store building, smithy, and a number of comfortable dwellings for employes.

Production of refined copper was 4,949,366 lbs. in 1902 and about 5,500,000 lbs. in 1903. The mine is looking better than for several years past and 1904 should bring a dividend. The Atlantic is a fine example of economy, ability and all-round honesty and fairness in mining.

ATLAS COPPER SYNDICATE, LTD.

Offices: St. James Sq., Manchester, England. It cannot be learned that the company owns any copper mining properties.

ATLAS EXPLORATION & MINING CO. **MEXICO.**

Office: Douglas, Ariz. James Ray, manager. Lands are in the northern part of the Arizpe district of Sonora, Mexico, about 15 miles south of Douglas, Cochise county, Arizona. Ores, carrying gold and copper, are to be shipped to smelters at Douglas and El Paso.

AKTIEBOLAGET ATVIDABERGS KOPPERVERK. **SWEDEN.**

Office and mine: Atvidaberg, Ostergothland, Sweden. Organized 1900, under laws of Sweden, with capitalization 900,000 kroner, fully paid, shares 1,000 kroner par. Baron Th. Adelswald, president and general manager; Axel Nygren, superintendent; C. A. Rudelius, smelter superintendent. Ore is slightly argentiferous chalcopyrite, averaging 2% copper. Has 8 shafts, of 300′ to 1,400′, with about 4,000′ of underground openings. Water power generates electricity that operates the mines and works. Has a smelter, at Bersbo, 9 kilometres from mine, with railroad connecting. Has a concentrator, smelter with 3 roasting furnaces, 3 reverberatory furnaces and settling tanks for cementation. Production in 1901 was 158,000 kgs. of cement copper; 60,959 kgs. of refined copper, and 186 kgs. of silver. A new shaft has been sunk recently in promising ground, and production is increasing.

AURORA MINING CO. **MEXICO.**

Letter returned unclaimed from La Cananea, Sonora, Mexico. Said to be prospecting on lands near the Greene Consolidated.

AUSTRALIAN COPPER SYNDICATE, LTD.

Offices: 2, Royal Exchange Ave., London, E. C., Eng. Formed "to acquire mines anywhere in the world." No returns secured, and it has not been learned that company owns any mining property.

AUSTRALIAN MINING CO., LTD. **AUSTRALIA.**

Offices: 42, New Broad St., London, E. C., Eng. Henry Collier, chairman; Sir. Samuel Davenport, K. C. M. G., Burnside, Adelaide, South Australia, colonial agent; Edgar Collier, secretary. Capital, £40,000, shares £2 par. Is a reorganization of the Australian Mining Co., which paid considerable dividends. Present company is paying annual dividends of 1s. per share. Lands, about 20,000 acres in the Reidy Creek district, including the Tungkillo mine, leased to the Kitticoola Copper-Gold Co.

AVINO MINES OF MEXICO, LTD. **MEXICO.**

Offices: Basildon House, Moorgate St., London, E. C., Eng. Mine office: Gabriel, Durango, Mex. Capital, nominal, £1,000,000; issued, £978,442; debentures, £18,800. Was reorganized, Feb. 24, 1903, shareholders being assessed 2s. 6d. and stock marked 17s. 6d. paid, the assessment paying a floating debt of about £50,000 and leaving about £70,000 for development and equipment. About 50,000 shares are owned in the United States. F. L. Gardner, chairman; W. Bramall, secretary; W. J. A. Palmer, mine manager. Lands, 610 acres, also a 302-acre damsite, 10 miles from a railroad, carrying a very large body of low-grade silicious silver-copper ores and said to have 2,000,000 tons of ore in sight. Values are mainly silver and copper, with a little lead, the highest grade ore being shipped to smelter. Has a 650′

shaft showing oxides and a little native copper in the lower levels, also a 600′ tunnel. Has steam and electric power. A large concentrator built on the property was found unsuited to the ore, and under the advice of Prof. Ottakar Hoffman was abandoned and replaced by a hyposulphite lixiviation plant of 100 tons daily capacity, which is saving 85% of the silver and 30% of the gold values. Property employs several hundred men. Former management spent too much money on surface and not enough in the mine, and also made a mistake in the plant devised for treatment. This is a very big low-grade property, requiring skillful and cautious handling, but with good management should make a large and profitable mine.

AZTEC MINE. NEW MEXICO.

Mine office: Mineral Hill, Grant Co., N. M. Is planning the erection of a 60-ton concentrator.

AZTEC COPPER CO. ARIZONA.

Office: 136 Hartford Bldg., Chicago, Ills. Mine office: Prescott, Yavapai Co., Ariz. E. M. Sanford, attorney; S. J. Goldie, superintendent. Lands, 20 claims, showing copper ores. Has steam power.

AZTEC COPPER CO. MICHIGAN.

Office: care of John C. Watson, treasurer, 68 Devonshire St., Boston, Mass. Lands, 1,534 acres, just east of the Hilton mine of the Adventure Consolidated, in Ontonagon county, Michigan. Has produced 353 tons, 863 lbs. of refined copper, of which 100 tons was secured in a single mass. Idle many years.

AZTEC COPPER MINING & SMELTING CO. MEXICO.

Office: 907 Stephen Girard Bldg., Philadelphia, Pa. Mine office: Rancho del Almirez, Jalisco, Mex. Capitalization $300,000. Dr. Pemberton Dudley, president; John R. Williams, treasurer; C. D. Lance, secretary. Company advertises its stock as a safe investment, but this opinion is not generally shared by people in a position to know.

AZTEC GOLD & COPPER MINING CO. COLORADO.

Office: 53 State St., Boston, Mass. Mine office: Needleton, La Plata Co., Colo. Organized 1899, under laws of Maine, with capitalization $2,000,000, shares $1 par. David W. Williams, president; Geo. F. Bradstreet, secretary and treasurer; W. Z. Kinney, general manager; Josiah Moore, superintendent. Lands, 40 claims, area 500 acres, showing 2 fissure veins averaging 2′ width and carrying sulphide ores with estimated average value of $18 per ton in gold, silver, lead and copper, developed by a 960′ tunnel. Has gasoline, water and electric power, and plans erection of a concentrator in 1904.

AZURITE COPPER CO. ARIZONA.

Office: Williams, Ariz. Mine office: Willaha, Coconino Co., Ariz. A. Tyroler, president; Olaf H. Prysź, secretary; John S. Green, superintendent. Organized under laws of Arizona, with capitalization $1,500,000, shares $1 par. Lands, 10 claims in the Francis district, on the line of the Santa Fe & Grand Canyon R. R., showing promising ore bodies. Company contemplates shipping ore to the smelter of the Anita Consolidated at Williams.

AZURITE COPPER & GOLD CO. **ARIZONA.**

Office: Tucson, Ariz. Mine office: Azurite, Pima Co., Ariz. Thos. Hughes, superintendent. Has auriferous and argentiferous copper ores, with steam power and 70-ton smelter. Lands, 13 claims, showing a large body of low-grade ore.

BABCOCK & KITTERMAN GROUP. **OREGON.**

At Althouse, Josephine Co., Ore. A prospect on which limited development work has secured good assay values.

BABY McKEE GOLD MINING CO. **OREGON.**

Mine office: Sumpter, Baker Co., Ore. L. G. Lilley, manager. Ores carry gold, silver, lead and copper. Has steam power and employs 10 men.

BACHELOR GOLD MINING CO. **COLORADO.**

Mine office: Lake City, Hinsdale Co., Colo. C. F. Meek, superintendent. Ores carry gold, silver, lead and copper. Has water power and employs about 25 men.

BADEN-BADEN GOLD MINING CO. **COLORADO.**

Mine office: Black Hawk, Gilpin Co., Colo. Newell Bros., managers. Has gold-silver-copper ores and steam power. Employed about 25 men at last accounts.

BADGER MINE. **COLORADO.**

On the Platte river, 12 miles east of Pearl, Colo. Owned by Alex. Hilton, et al. Has a limited amount of development work, with a good showing of high-grade ores.

BADGER COPPER CO. **WYOMING.**

Organized 1902, to operate in Albany county, Wyoming, with headquarters at Laramie, Wyo. Letter to company returned unclaimed.

BADGER STATE MINING & MILLING CO. **WYOMING.**

Office and mine: Saratoga, Carbon Co., Wyo. Employs 5 men. Gustave Jensen, president and general manager; C. E. Jensen, secretary and treasurer; John H. Davis, superintendent. Organized December 26, 1901, under laws of Wyoming, with capitalization $1,000,000, shares $1 par. Lands, 8 claims, area 140 acres, showing 3 fissure veins, averaging 4′ width, and giving average assays of 50% copper, 50% lead and from a trace up to 400 oz. silver per ton, opened by shafts of 60′ and 105′ and a 90′ tunnel. Company plans sinking shaft to a depth of 300′ in 1904.

BAHIA EXPLORATION CO. **BRAZIL.**

Has sundry copper claims about 50 miles west of Jaguarary, Brazil, showing ores assaying 2% to 4% copper.

BALACLAVA COPPER MINING CO. **AUSTRALIA.**

Mine office: Broken Hill, N. S. W., Australia. W. O. H. Simons, superintendent. Has auriferous copper ores and employs about 20 men.

BALADE MINE. **NEW CALEDONIA.**

Address: probably Noumea, New Caledonia. Mine discovered 1884. Ores are concentrated up to 17 to 20% copper. Production small.

BALAKLALA CONSOLIDATED COPPER CO. **CALIFORNIA.**

Office: 222 Bush St., San Francisco, Cal. Mine office: Kennett, Shasta

Co., Cal. Peter L. Kimberly, president; C. A. Malm, vice-president and treasurer; W. F. Snyder, general manager; Grant Snyder, superintendent. Company succeeded the Balaklala Mining Co. Lands, 64 claims, adjoining the Trinity mine, formerly under bond to the Mountain Copper Co., but not taken because of a defective title since remedied by the courts. Principal development is on El Capitan group, opened by tunnels showing a sulphide ore body 60′ to 100′ wide on the 400′ level, ore ranging from very poor to very good, and said to show an average of better than 11% copper. Property has been extensively probed by diamond drills, which have shown several large deposits about 100′ below the body opened by tunnel. Ore occurs in lenses, the largest being estimated at 50x500x700′ in size. Has steam and electric power, with line surveyed for railroad to connect the mine and smelter-site. It is planned to build a large smelter, probably of about 500 tons capacity, in the near future. The Balaklala is controlled by strong men and apparently is a valuable property.

BALD MOUNTAIN MINING CO. **WASHINGTON.**

Has claims near Clear Lake, Skagit Co., Wash. A. H. Rogers, superintendant, at last accounts.

BALHANNAH COPPER & GOLD MINE, LTD.

Not found by postal authorities at former address, Broad Street House, London, E. C., Eng. Probably moribund.

BALKAN COPPER CORPORATION, LTD. **TURKEY.**

Offices: 6, Redcross St., London, E. C., Eng. Sir Owen R. Slacke, chairman; Ernest A. Foster, secretary; Mario Kreiger, managing director in Turkey. Capital, nominal, £20,000. Property is the Yardimly copper mine, area 7,900 acres, and the Chapzi-Hane mine, area 2,500 acres, in the Rhodope Mountains, northwest of Constantinople, held on an annual rental of £420 and 5% royalty on gross profits.

BALLA BALLA COPPER MINES, LTD. **AUSTRALIA.**

Reorganized as New Balla Balla Copper Mines, Ltd.

BALLARAT COPPER MINING CO. **WASHINGTON.**

Mine office: Newport, Stevens Co., Wash. Ores carrying gold, copper and silver are being developed by a crosscut tunnel.

BALLARAT & LYELL MINES, LTD. **TASMANIA.**

Offices: 24, Blomfield House, London Wall, London, E. C., Eng. Herbert Allen, chairman; W. V. Ward, secretary. Is a reorganization of the Great Mount Lyell Copper Co., Ltd. Capital, nominal, £250,000. Lands, 639 acres, held on 21-year lease from 1898, at £170 annual rental. Has about 3,000′ of underground openings, with narrow veins found at two points. Employed 3 men at last accounts.

BALTIC MINING CO. **MICHIGAN.**

Office: 11-13 William St., New York. Mine office: Baltic, Houghton Co., Mich. A large producer, employing about 600 men. Organized December, 1897, under laws of Michigan, with capitalization $2,500,000, shares $25 par, $18 paid in. Annual meeting, first Monday in March. John Stanton, president; John R. Stanton, secretary and treasurer; John Stanton, Joseph E. Gay, Wm. A. Paine, S. L. Smith and Cameron Currie, directors; Frank McM. Stanton, agent; F. W. Denton, superintendent; Martin Trethewey, mining captain; Wm. C. Cole, clerk; F. G. Coggin, mill superintendent; W. J. Richards, master mechanic. Practically the entire stock issue of the Baltic is owned by the Copper Range Consolidated Company.

Official returns to the state of Michigan, as of date January 1, 1903, disclose the following figures:

Amount cash paid in on capital stock	$1,800,000.00
Amount paid in by conveyance of property to company	1,000,000.00
Entire amount invested in real estate	1,014,750.00
Amount of personal estate	180,048.10
Amount of unsecured or floating debt	396,878.69
Production of copper in 1902,	6,285,819 lbs.

Lands, 800 acres, near the Eastern Sandstone of the Keweenawan copper belt, about 75 acres being on the sandstone and non-mineralized. Holdings comprise all of Section 21 except the southeast quarter, and the west half of Section 20, Town 54 North, Range 34 West. Is bounded on the north by the Wheal Kate and Section Sixteen of the Atlantic; on the east by St. Mary's Mineral Land Co., on the south by St. Mary's lands, lands of Hussey, Howe & Co. and the Trimountain mine; on the west by the Trimountain. The Baltic is 2½ miles due south of the Atlantic, and its northermost shaft is not quite 4 miles south of No. 10, the southermost shaft of the Huron mine of the Isle Royale. To the southward the Trimountain and Champion mines are opened on the same lode, which has a strike of N. 63° E. from Baltic shafts 2 to 5. To the northeastward of No. 5 the strike and continuation of the lode are uncertain. There is an extensive fault in this direction, not yet reached by the north drifts from No. 5, and the lode is probably thrown some distance to the eastward. The dip of the lode averages about 73°, the sharpest of any developed cupriferous bed in the Lake district.

The Baltic shafts are numbered from south to north. No. 1, the discovery shaft, located between Nos. 2 and 3, was abandoned at a depth of 219′, having been sunk at a wrong angle. No. 2, the southermost shaft, is 260′ deep, and drifts toward it from No. 3 indicate the advisability of the resumption of sinking in No. 2. No. 3 is 1,170′ northeast of No. 2 and nearly 1,000′ deep. No. 4 is 900′ northeast of No. 3 and about 950′ in depth. No. 5 is 855′ northeast of No. 4 and is also about 1,000′ deep. The extreme shafts No. 2 and No. 5, are 3,025′ distant, in addition to which 750′ has been proven by the north drifts of No. 5. Shafts 3, 4 and 5 are the principal producers. The engine house at No. 3 is 38x50′, of steel frame with concrete filling. The shaft-rockhouse is a 35x71′ with 17x31′ wing and is 88′ high, of wood sheathed with steel, and has a 16x18″ engine, two 18x24″ Blake crushers and rock bins with 1,400 tons storage capacity. No. 4 shaft has a Nordberg conical hoist, good for a depth of 5,000′, installed in 1903. The shaft-rockhouses at Nos. 4 and 5 are practically duplicates of that at No. 3. No. 5 shaft is timbered to the seventh level and will materially increase its depth in 1904. The north drifts from No. 5 show settled ground on the lower levels. The Baltic amygdaloid is an exceptionally strong lode, ranging from 15′ to 60′ in width, and is so well mineralized that at most points it must be more or less thouroughly beaten away from wall to wall. The great width of the stopes has brought about the use of a walling system, by which waste rock is built into dry-walls along the drifts, thus saving timbering, while giving stronger walls than any timber could supply, saving the cost of hoisting lean rock. The walling system of the Baltic has given rise to some controversy, certain authorities deeming it expensive and unsatisfactory, but it so happens that the men in actual charge of the mine, who are perhaps best acquainted with the circumstances, are thoroughly satisfied that the method is the best available for the peculiar requirements of the mine. A little melaconite is found in narrow fissure veins crossing the lode, these being too small to follow, but the black oxide ore mind in the stopes is saved in the milling, carrying 35% to 40% copper, as dressed, and smelts readily with the native copper mineral. The native copper of the Baltic is arsenical, and it is possible that a small amount of copper arsenides are mined and milled, as narrow arsenical fissure veins occur occasionally in the district south of Portage Lake. While the product is arsenical, it makes wire of great tensile strength. The Baltic lode, taking its name from the first mine opened upon it, was discovered in 1882 but was abandoned at shallow depth because a drill-hole pitched at a wrong angle ran into the hanging wall. Since taken over by the present company, progress has been continuous and highly satisfactory. The company began 1903 with a debt of almost $400,000, all of which was liquidated and a credit balance accumulated by net earnings of the year.

The compressor house, between shafts 3 and 4, is 36x58′ in size, of stone, with concrete foundations and steel roof, housing a compressor with capacity to reduce 4,000 cubic feet of free air per minute to a pressure of 70 lbs. per inch. The mine operates about 45 power drills. Adjoining is a boiler house of similar material, 49x76′, with wing 12x62′, having four 250-h. p. Stirling water-tube boilers and a 140′ self-supporting steel smokestack. This boiler plant supplies steam for shafts 3 and 4. Adjoining the boiler house is a 360′ coal trestle, with storage capacity of 5,000 tons, underneath being a 5x8′ concrete tunnel, through which coal is hauled in tram-cars on a down grade by an endless cable. There is also a complete electric plant. The mine structures include a 50x132′ combination machine-shop and smithy, with stone walls and steel roof; a 42x72′ carpenter shop; a commodious office building; 30x90′ miners' changing house, supplied with hot and cold water, bath-tubs and lockers, and about 75 well-built dwellings for employes. The mine is on the Painesdale branch of the Copper Range railroad and is also reached by a branch of the Atlantic railroad.

The stamp-mill is at Redridge, on Lake Superior, half a mile west of the Atlantic mill, and went into commission December, 1901. The mill proper is 175x195′, of structural steel on stone foundations, the foundation alone costing nearly $90,000. There are 4 Nordberg stamps with 20x24″ cylinders, crushing about 500 tons each, daily. Foundations for the stamps are the most massive ever set, the use of timber having been dispensed with, there being 90-ton anvil plates beneath the mortars. Eight Wilfley concentrators replace finisher jigs and slime tables. A compound condensing Corliss engine runs the 4 stamps and washing machinery. The discharge at the mill is 25′ above the mean water datum, and with the usual drop of one in ten provides for the wasting of many millions of tons of tailings by gravity.

The mill is heated by the Coogan & Strothenke system, air being delivered from 4 blowers, after previous heating by passing over steam coils, radiation in the coils being insured by the vacuum system. Adjoining the mill is a 55x90′ boiler house, of steel frame on stone foundations, housing five 250-h. p. Stirling water-tube boilers, and a Green fuel economizer. Draft is secured by a set of duplex fans, driven by the mill engine. Behind the boiler house is a 25,000-ton coal storage yard, for the joint use of the Baltic and Atlantic mills. Coal is brought to the boilers through tunnels, by gravity. The mill has centrifugal crushing rolls for regrinding, and is stamping about 1,700 tons daily. It is hoped to eventually raise the capacity to nearly or quite 2,000 tons daily.

Water for both the Baltic and Atlantic mills is furnished by a steel gravity dam across the mouth of Salmon Trout river, built jointly by the Atlantic and Baltic mines, at a cost of about $150,000. This structure is built of steel and anchored by its own weight, irrespective of the holding power of the rock. The plan was suggested by J. F. Jackson, of the Wisconsin Bridge & Iron Co., and the details inspected and approved by Foster Crowell, who acted as consulting engineer during construction. The dam was built by the Wisconsin Bridge & Iron Co., and Prendergast & Clarkson, the completed work requiring about 1,000,000 pounds of steel and 8,000 cubic yards of concrete work. It impounds about 1,250,000,000 gallons of water and at the river's lowest stage can furnish water to wash 5,000 tons of rock daily, 300 days each year. As the cost of pumping water at other mills in the district averages about 2 cents per ton of rock stamped, the dam effects a great saving. The dam is anchored in a cement foundation of great strength, and is in five sections, with a total length of 475′, the central or deepest section being 74′ high. There is a wing 200′ long on the west and a 350′ wing on the east, these being in comparatively shallow water and made with cement cores built up from excavations in bed-rock, buttressed by earth embankments. The five sections of the dam proper are all of the same general design, the central section being highest, as it is bottomed in the bed of the river, and having a wider and heavier concrete base, with a stronger steel bracing. The dam is of steel throughout, anchored in a concrete base, with braces between the crest of the dam and the extreme foot of the cement base. The following description of the central section will give an idea of the general construction of all five parts. The concrete base is 62′ wide, built up from rock excavations. The resultant of all pressures gives a pressure of 2,626,000 pounds for each steel section of 8′ width and 74′ height. The upper 50′ of the dam in this central section of 100′ is inclined from the water at an angle of 45°, throwing the point of overturning within the central third of the concrete base, thus allowing an ample margin of safety. The dam is made of plates of best boiler steel, concave on the water side, 8x16′ in size and ⅝″ thick, riveted and caulked watertight and supported by parallel inclined "I" beams 24″ thick for the full depth of 50′ below the crest of the dam. On the lower section the steel plates are each 8x16′ and 3-16″ thick, concave, riveted and caulked, but resting directly against the concrete base. The "I" beams of the upper or main section are supported by heavy triangular frameworks of inclined steel columns and struts. The entire steel structure is anchored to a 2″ steel base-plate at the bottom of the concrete by a large number of 1.5″, 2″ and 2.5″ steel rods, of 15′ to 30′ in length. Water is taken from the dam about 20′ below the crest by three 38″ riveted steel pipes, one pipe being on the Atlantic and two on the Baltic side. There is a system of valves and waste weirs, but the structure is of such a nature that it could not be injured were water to flow continuously over its crest for an indefinite period. Surmounting this dam is a trestle of the Copper Range railroad, built at the same time but in nowise a portion of the dam. The center of the railroad track is 7′ above the crest of the dam, 10′ downstream. In the central sections the foundations for the feet of the trestle are all in the concrete work, elsewhere the northern piers for the trestle are separately built.

The Baltic began production in August, 1899, with one leased stamp at the Atlantic, a second stamp being leased one year later. The first stamp in the Baltic mill was started December 19, 1901, the second in February and the third in August, 1902, while the fourth, which began work on the Champion rock, in 1902, started on Baltic rock upon the completion of the Champion mill. The Baltic is fortunate in possessing a strong and well mineralized lode, and has been equally fortunate in having an experienced and highly capable management during its period of development. The growth of the property is best shown by the figures of production. In 1901 the mine made 2,641,432 lbs. of refined copper; in 1902 the output was 6,285,819 lbs., and in 1903 was about 10,500,000 lbs. of refined copper secured from a mineral production of 15,267,980 lbs. Production for 1904 will probably be at the rate of about 1,000,000 lbs. monthly. The Baltic is one of the best of the newer Lake Superior mines, and has before it a long and highly promising life, during which it should return to its owners many millions of dollars in net profits.

BALTIMORE COPPER, SMELTING & ROLLING CO. MARYLAND.

Office and works; Baltimore, Md. Does an extensive smelting and refining business, mainly on imported mattes and blister copper. Has a contract, expiring 1905, for refining the blister copper of the Mt. Lyell Mining & Railway Co.

BALTIMORE & SONORA GOLD & COPPER CO. MEXICO.

Office: 909 Maryland Trust Bldg., Baltimore, Md. J. O. Johnston, president; Chester F. Johnston, seecretary. Capitalization $5,000,000, shares $10 par. Lands, 387 acres in the Arizpe district of Sonora, Mexico, on the western slope of the Cananea Mountains, showing large and promising outcrops of carbonate and silicate copper ores. Property is considered decidedly promising.

BALVANERA MINING CO. **MEXICO.**

Office: 11 Broadway, New York. Herbert T. Beatty, president; Chas. W. White, secretary and treasurer. Last heard of company was the arrest of the president at the instigation of the secretary, for alleged misappropriation of funds.

BANNER GOLD & COPPER MINING CO. **WASHINGTON.**

Mine office: Chelan, Okanogan Co., Wash. Dr. J. L. Jacobs, president; R. W. Eager, secretary. Main tunnel 101′. Has secured ores assaying 18% copper and $15 to $33 gold per ton. Purposes installing a water power plant and air compressor. Idle, but will resume work when snow leaves in spring of 1904.

BARAGUNDA MINES. **INDIA.**

At Baragunda, Hazaribagh, Bengal, India. Were operated 1887 to 1891, turning out about 1,000 tons of copper in five years. Ore occurs as chalcopyrite, running only 1% to 3% copper, in a gangue of micaceous schist. All ore mined was carted 24 miles to the smelter at Giridhi.

SUCESION DE BARAZARTE. **CHILE.**

Mine office: Paposo, Taltal, Antofagasta, Chile. Ernesto Gabler, superintendent. Property includes the Reventon mine, 400′ deep, and the Abundancia mine, 380′ deep, both opened in 1830, also the Union mine. Has steam power and employs about 50 men.

BARE HILL MINE. **MARYLAND.**

Owned by Albert Smyser, York, Pa. An old property, showing slightly auriferous and argentiferous chalcopyrite and bornite.

BARKIS & JOHNSON CO. **PERU.**

This firm shipped about 3,000 tons of matte, averaging 40% to 50% copper and 225 oz. silver per ton, in 1902, and expected to double this amount in 1903.

BAROTSE COPPER CO., LTD. **RHODESIA.**

Offices: 19, St. Swithin's Lane, London, E. C., Eng. A. W. Bird, secretary. Lands are in Rhodesia. Understood that property is to be sold to Rhodesia Copper Co., Ltd., for a stock interest in latter.

BARRANCA COPPER CO. **MEXICO.**

Office: 120 Liberty St., New York. Mine office: Barranca del Cobre, Chihuahua, Mex. W. I. B. Cowell, manager. Operates La Purisima mine, producing copper, gold and silver. Main shaft 750′; main tunnel 2,100′. Has water power, 20-stamp mill, two 4′ Huntington mills and a 60-ton smelter.

BARSTOW MINES. **COLORADO.**

Mine office: Ironton, Ouray Co., Colo. John Geisel, superintendent. Have auriferous and argentiferous copper ores.

BASIN GOLD & COPPER MINING CO. **MONTANA.**

Office: care of E. R. Holden & Co., 20 Broad St., New York. Mine office: Basin, Jefferson Co., Mont. Robt. B. Smith, president; M. L. Hewitt, vice-president and general manager; B. Lowinson, secretary and treasurer. Lands, 280 acres, patented, on which considerable development has been secured. Company involved in litigation and financial difficulties at last accounts.

BASIN & BAY STATE MINING CO. **MONTANA.**

Mine office: Basin, Jefferson Co., Mont. Has a large concentrator, leased to the United Copper Co.

BASSETT MINES, LTD. **ENGLAND.**

Office and mines: Bassett Mines, Redruth, Cornwall, England. F. Oats, chairman; R. Rendle, secretary; W. James, mine manager. Capital, nominal, £100,000, but property is operated on the cost-book plan. Is primarily a tin mine, but produces a little copper. Is developed by shafts and has steam power and stamps.

JOHN BATES. **BOLIVIA.**

Office and mine: Coro Coro, La Paz, Bolivia. Works a conglomerate carrying native copper. Has steam power and employs a small force.

BATES MINING & SMELTING CO. **MASSACHUSSETTS.**

Office: Gardner, Mass. Mine office: Charlemont, Franklin Co., Mass. Employs 5 men, in development work. Organized 1902, under laws of Maine, with capitalization $200,000, shares $1 par. Wm. H. Bates, Jr., president and general manager; Anton Scholz, Jr., secretary; J. North, mining captain. Lands, about 75 acres, showing three 3′ fissure veins. Ores are chalcocite, bornite and chalcopyrite, assaying 16% copper and $10 gold per ton. Has one shallow shaft, one 60′ tunnel and an open cut.

BATTLE COPPER MINING CO. **WYOMING.**

Office: care of Delaney & Delaney, Colorado Springs, Colo. Mine office: Battle, Carbon Co., Wyo. Organized 1898, under laws of Colorado, with capitalization $1,500,000, shares $1 par. W. H. Baker, president; J. V. Helm, secretary and treasurer; W. C. Leadbetter, general manager. Lands, 3[illegible] patented claims, area 54 acres, showing 9 contact veins with average estimated width of 30′, length 2,000′ and estimated average value of 11% copper and $4 to $40 gold per ton. Ore is sulphide. Has 13 shafts, of 10′ to 213′, with steam power, and is on line of aerial tram to the Encampment smelter.

BATTLE LAKE COPPER EXPLORATION CO. **WYOMING.**

Office: 25 East Pike's Peak Ave., Colorado Springs, Colo.

BATTLE LAKE & BATTLE CREEK MINING CO. **WYOMING.**

Office: care of N. B. Noble, Rice Lake, Wis. Lands are in Wyoming.

BATTLE LAKE TUNNEL SITE MINING CO. **WYOMING.**

Office: 1122 Chamber of Commerce, Chicago, Ills. Mine office: Rambler, Carbon Co., Wyo. Employs 25 men. M. A. Cheney, president; J. W. Brooks vice-president; H. J. Stegemann, secretary and general manager; J. L. Powell, superintendent; R. G. Legg, consulting engineer. Organized 1900, under laws of Wyoming, with capitalization $2,500,000, shares $1 par. Lands, 30 claims, 11 patented, area 600 acres, also 80 acres of miscellaneous lands, in the Battle Lake district. Country rocks are granite, diorite and quartzite, showing sundry veins, of which 5 are being opened, these averaging 4′ in width, and carrying a great variety of oxide, carbonate and sulphide ores giving average assays of 40.7% copper from carload shipments. Mine is opened by a 300′ shaft and 3 long tunnels. Has a 120-h. p. steam equipment with hoist good for depth of 1,000′ and an 8-drill Norwalk air compressor, 4 power drills and necessary mine buildings and dwellings. Company is conservatively managed and has ore bodies of altogether exceptional richness, and apparently of considerable extent.

BAUMANN COPPER CO. **ARIZONA.**

Office: Prescott, Ariz. Mine office: Dewey, Yavapai Co., Ariz. Employs 10 men. H. P. Anewalt, president; Jules Baumann, secretary and general manager; W. S. Goldsworthy, treasurer. Lands, 25 claims, area 500 acres, in the Agua Fria district, showing numerous fissure veins carrying sulphide ores giving average assays of 10% copper, 2 oz. silver and 0.07 oz. gold per ton. Has 25 shafts and pits, deepest 214′, also tunnels of 60′ and 305′. Returns from 62 tons of ore shipped to the Val Verde smelter, 2½ miles from the mines, were 15.5% copper, 10.3 oz. silver and $1.67 gold per ton. Main vein has been traced two miles on the company's lands, showing pay ore wherever opened.

SOCIEDAD MINERA Y FUNDICION DE BAUSCH Y TIANI. **ARGENTINA.**

Office, mines and works; Chilecito, Rioja, Argentina. Operates the San Pedro, Mercedes and other mines, producing copper, silver and lead. Has water and steam power and operates the "San Miguel" smelter, employing several hundred men.

BAXTER MINE. **CALIFORNIA.**

A partially developed prospect, near the Bully Hill mine, at Redding, Shasta Co., Cal.

BAY COPPER MINES, LTD.

Offices: 142, Palmerston House, London, E. C., Eng. John Robertson, managing director; W. R. Caldwell-Moore, secretary. Capital, nominal, £35,000; issued, £15,007.

BAY HORSE COPPER MINING CO. **WYOMING.**

Mine office: Riverside, Carbon Co., Wyo. W. G. Foss, superintendent.

BEAN COPPER CO. **ARIZONA.**

Mine office: Gila Bend, Pima Co., Ariz. C. C. Bean, manager.

BEAR CREEK MINING CO. **CALIFORNIA.**

Office: 18 Naylor-Cox Bldg., Terre Haute, Ind. W. R. McKeen, president; A. W. Wright, managing director; Henry C. Albrecht, secretary. Property is in Mariposa county, California.

BEAR GULCH MINING CO. **MONTANA.**

Office: Butte, Mont. Mine office: Twin Bridges, Madison Co., Mont. Alex. Johnson, owner; Edson C. Baxter, superintendent. Property is the Mountain View group, carrying auriferous and argentiferous copper ores, opened by tunnel. Has steam power and employs 15 men.

BEAR MOUNTAIN MINING & DEVELOPMENT CO. **WASHINGTON.**

Mine office: Colville, Stevens Co., Wash. C. G. Carruthers, superintendent. Was driving a tunnel, to develop ore body carrying gold, silver and copper, at last accounts.

BEAR MOUNTAIN TUNNEL & MINING CO. **COLORADO.**

Mine office: Crystal, Gunnison Co., Colo. H. H. Williams, superintendent.

Has argentiferous and slightly auriferous copper ores, opened by tunnel. Has water power and employs 10 to 15 men.

BEATRICE MINING & MILLING CO. MONTANA.

Mine office: Elliston, Deer Lodge Co., Mont. Abner Knapp, superintendent. Ores carry gold, silver and copper. Employs 10 men.

BEAVER CONSOLIDATED MINING CO. UTAH.

Office: 23 Eagle Blk., Salt Lake City, Utah. Mine office: Milford, Beaver Co., Utah. J. J. Trenam, president and general manager; B. L. Corum, secretary; H. D. Trenam, superintendent. Organized 1902, under laws of Utah, with capitalization $1,000,000, shares $1 par. Lands, 10 claims, area 190 acres, near the O. K. mine of the Majestic. Has secured assays of 5% to 50% copper, with considerable gold and silver values, from sulphide ore taken from numerous shallow workings. Has a 509′ two-compartment shaft showing a promising ore body at the bottom. Has steam power and air compressor.

BEAVER COPPER MINING CO. WYOMING.

Office: Encampment, Wyo. Mine office: Downington, Carbon Co., Wyo. Organized under laws of Wyoming with capitalization $1,000,000, shares $1 par. S. H. Scofield, president and general manager; E. H. Parkison, secretary and treasurer; W. H. Parkison, superintendent. Lands, 7 patented claims, area 120 acres, showing 2 fissure veins, one with width of 40′ carrying oxide ores with estimated values of 11.5% copper and $10 gold per ton. Has a 900′ tunnel and 225′ shaft, with steam power and air compressor.

BEAVER LAKE COPPER CO. PENNSYLVANIA.

Mine office: Bloomsburg, Columbia Co., Pa. Has secured ores assaying 17% copper.

BEAVER VALLEY COPPER CO. IDAHO.

Black Bird Copper-Gold Co. intends taking this title.

BECKLER RIVER GROUP. WASHINGTON.

Sold to Apex Mining Company.

BEDE METAL & CHEMICAL CO., LTD. SPAIN.

Offices: Hebburn-on-Tyne, Eng. General Spanish offices: Manriques, 9, Cordoba, Spain. Organized 1871, with capital, fully paid, £115,360, in £10 shares. Dividends for 1901 and 1902 were 5% each year. Sir Andrew Noble, K. C. B., F. R. S., chairman; W. W. Brown, secretary; Richard E. Carr, general mine manager; C. E. Turner, engineer. This company is primarily a manufacturer of acids and other chemical products, but secures a considerable amount of copper from the cinders of Spanish and Norweigan cupriferous pyrites. Principal mining property, area 136 hectareas, is Las Herrerias mine, at Puebla de Guzman, Huelva, Spain, operated under lease from C. and J. Sundheim, this property including 7 mines, in two groups, and employing several hundred men. The main ore body is a large, irregular mass of solid cupriferous iron pyrites in schists, giving average values of 1.5% copper and 47% sulphur. Main shaft is 235′, the principal workings being open-cast with two mineral floors, each about 16 meters in height. Has steam power and one locomotive. Ore as mined is placed in level-top piles 6 to 8 metres high, in open air and these are sprinkled systematically, the leach-water, carrying 2% to 2.5% copper, being drawn off through long, narrow channels, containing pig iron, and the resulting precipitate, averaging 70% to 80% copper, is dried and shipped to the company's works in England for refining. Gross production of refined copper to end of 1902 was 3,200 tons. Production in 1902 was 560 tons and in 1903 about 400 tons of refined copper.

BELCHER MINE. WASHINGTON.

In Ferry county, Washington. Produced a limited quantity of good copper ore in 1901.

BELENE COPPER CO. MEXICO.

Office: 905 Journal Bldg., Chicago, Ill. Mine office: El Copete, Sonora, Mex. Organized 1901, under laws of Arizona, with capitalization $5,000,000, shares $5 par. Registered and protocolized in Mexico, June 25, 1902. S. E. Hostetter, president; James Baynes, secretary and treasurer; J. J. Hardwick, general manager; Luis Killeen, assistant manager. Lands, 405 acres, in the Ures district, showing two very large sulphide ore lenses giving average assays of 12% copper, 8 oz. silver and $10 gold per ton. Has 9 shafts, of 65′ to 310′ depth, and 3 tunnels, of 40′ to 200′ length, with about 1,500′ of underground openings. Plans to install steam and electric power and build a 200-ton smelter when nature of ores below waterline is developed. Smelter of Copete Mining Co. is on lands of the Belene, Management is good and the property is regarded as promising.

SOCIETE ANONYME BELGE POUR LA RECHERCHE ET L'EXPLORATION DES MINERAIS. ITALY.

Mine office: Massa Maritima, Grosseto, Italy. A Belgian company, operating a pyrite mine.

BELL MARE COPPER MINING & SMELTING CO. NEVADA.

Merged in the Nevada Bell Copper Mining & Reduction Co.

BELLE OF GRANITE MINE. COLORADO.

Mine office: Granite, Chaffee Co., Colo. B. H. Pelton, superintendent. Ores carry gold, silver and copper; steam power; mine opened by shaft; employed a small force at last accounts.

BELLE MARSH COPPER MINE. IDAHO.

A prospect, near Pocatello, Idaho, said to be valuable, regarding which no returns have been secured.

BELMONT MINING CO. COLORADO.

Mine office: Winfield, Chaffee Co., Colo. Jas. Beuell, superintendent. Has gold-silver-copper ores; was driving a tunnel with a small force, at last accounts.

BELMONT MINING CO. MONTANA.

Office and mine: Butte, Silver Bow Co., Mont. Has 100,000 shares, of which 95,000 are owned by the United Copper Co. Property is in the eastern part of Butte. Upper levels gave good ore, but at a depth of 400′ changed to low grade. Shaft was 800′ deep at end of 1903, and to be sunk to depth of 1,000′ and eventually to 1,200′, being planned to open a rich vein thought to dip under the Belmont property.

BELMONT CHEMUNG MINING CO. COLORADO.

Mine office: Black Hawk, Gilpin Co., Colo. Wm. Mitchell, superintendent. Ores carry gold, silver and copper. Has steam power.

BELT MINES. MICHIGAN.

Owned by John H. Rice, et al, Houghton, Mich. Mines located in Ontonagon Co., Mich. First opened 1848; taken over by Belt Mines company, Ltd., in 1882, which company, by incompetence and bad management, lost about £250,000 in three years, without securing a half mile of underground openings. Fully described in Vol. II.

BEN FRANKLIN GOLD MINING CO. WASHINGTON.

Mine office: Bossburg, Stevens Co., Wash. A. A. Anderson, superintendent. Was prospecting gold-copper ore bodies, at last accounts.

BEN HARRISON GOLD & COPPER MINING & MILLING CO. UTAH.

Office: 23 Eagle Blk., Salt Lake City, Utah. Mine office: Milford, Beaver Co., Utah. Organized Sept. 16, 1897, under laws of Utah, with capitalization $500,000, shares $1 par. F. Eberhardt, president; J. J. Trenam, vice-president and manager; B. L. Corum, secretary; H. D. Trenam, superintendent. Lands, 11 claims, area 195 acres, showing 2 fissure veins opened by a 300′ shaft showing sulphide ores giving estimated values of 5% copper, 10 oz. silver and $7 gold per ton. Has steam power.

BEN HUR COPPER MINING CO. WYOMING.

Office: 34 Clark St., Chicago, Ill. Mine office: Battle, Carbon Co., Wyo. Employs 3 men. Chas. G. Mason, president; Clifford M. Miller, secretary and treasurer; N. C. Bowen, superintendent. Organized November, 1902, under laws of Wyoming, with capitalizaton $1,000,000, shares $1 par. Lands, 4 claims, area 60 acres, showing 3 fissure veins, largest 40′ wide and developed by a 110′ tunnel, showing sulphide ore.

BENTON MINES. CALIFORNIA.

A group of 36 claims, in the White Mountains, 8 miles east of Benton, Mono Co., Cal., on which a limited amount of development work has been done.

BEREHAVEN COPPER MINES, LTD. IRELAND.

Offices: 19, St. Swithin's Lane, London, E. C., Eng. Mine office: Allihies, County Cork, Ireland. W. L. Boyle, chairman; H. T. Adams, secretary. Capital £200,000; debentures, £100,000 authorized, £87,500 issued, at 5%.

JOSE BERNARDINO. MEXICO.

Name is given by Mexican government as operator of a copper mine at Nombre de Dios, Durango, Mex.

BERSBO COPPER WORKS. SWEDEN.

Address; Bersbo, Ostergothland, Sweden. This is the smelting plant of the Aktiebolaget Atvidabergs Kopperverk.

TESTAMENTARIA DE NOEL BERTHINI. BOLIVIA.

Office and mines: Coro Coro, La Paz, Bolivia. Works cupriferous conglomerates, similar to those of the Lake Superior district, copper occurring native. Annual production, about 1,200 tons of mineral, averaging 90% fine copper, according to American consul at La Paz. Is the second largest copper producer of Bolivia. Has steam power and smelter and employs 300 to 400 men.

BESA y CA. **CHILE.**

Office and mine: Chañaral, Atacama, Chile. Edouardo P. Tellez, general manager. Employes 500 men. Property includes the Andacollo, Manto, Verdi and Ironton mines. Has steam power and smelter, shipping product as matte, securing an annual production of about 2,500,000 lbs. of refined copper.

BESSEMER IRON ASSOCIATION. **NEW MEXICO.**

Mine office: Hanover, Donna Ana Co., N. M. A. E. Dawson, lessee, at last accounts. Company owns the Anson S. copper mine, which is supposed to be idle.

BESSHI MINE. **JAPAN.**

See Sumitomo Copper Co.

BETTS COVE MINE. **NEWFOUNDLAND.**

At Betts Cove, Newfoundland. Worked 1874–1884; reopened by an adit in 1900, but again idle.

BEULAH COPPER CO. **WYOMING.**

Office: 113 Devonshire St., Boston, Mass. Mine office: Battle Carbon Co., Wyo. Capitalization $1,000,000, shares $1 par. Frank S. Morrison, president; J. F. Leadbetter, manager. Lands, 13 claims, area 250 acres, developed by an 800′ tunnel. Probably has been absorbed by United Exploration Co. of Boston.

BIG BUG GOLD & COPPER MINING CO. **ARIZONA.**

Office: Byrne Bldg., Los Angeles, Cal. Mine office: care of Thos. C. Job, Prescott, Yavapai Co., Ariz. J. H. Canovan, president and general manager. Lands, 62 acres, in the Big Bug district of Yavapai county.

BIG COLORADO MINING & MILLING CO. **COLORADO.**

Mine office: Gladstone, Colo. C. W. Bloodgood, manager. Ores carry gold, silver, copper and lead. Has electric and gasoline power.

BIG COTTONWOOD COPPER & GOLD MINING CO. **UTAH.**

Office: 305 Auerbach Bldg., Salt Lake City, Utah. Mine office: Brighton, Salt Lake Co., Utah. Nicholas Treweek, president; Joseph G. Fariss, secretary; Will L. Treweek, general manager. Capitalization $1,500,000, shares $5 par. Is developing by tunnel and is said to have a fair showing of ore.

BIG CREEK COPPER MINING CO. **WYOMING.**

Office and mine: Encampment, Carbon Co., Wyo. L. D. Godshall, superintendent.

BIG HORN MINING CO. **COLORADO.**

Mine office: Pearl, Larimer Co., Colo. May consolidate with Pearl Land & Townsite Co.

BIG INDEX GOLD & COPPER MINING CO. **WASHINGTON.**

Office: 419 Pioneer Bldg., Seattle, Wash. Mine office: Index, Snohomish Co., Wash. Employs 6 men. Wm. Frankfurt, president; J. C. Rathbun, secretary. Organized 1902, under laws of Washington, with capitalization $2,500,000, shares $1 par. Lands, 15 claims, area 300 acres, in the Washington district, opened by a 350′ tunnel, showing ores giving average assay values of $26 per ton.

BIG SHOW SILVER & COPPER MINING CO. **MONTANA.**

Mine office: Twin Bridges, Madison Co., Mont. Organized under laws of Arizona, with capitalization $1,500,000, shares $1 par. Lands, 4 claims. Ores carry gold, silver and copper.

BIG YANK MINING & MILLING CO. **OREGON.**

Office: 414 Abington Bldg., Portland, Ore. Mine office: Galice, Josephine Co., Ore. J. C. Mattison, superintendent. Has auriferous and argentiferous copper ores, and employs about 10 men.

BIGELOW GOLD & COPPER MINING CO. **NEW MEXICO.**

Office: 49 Exchange Place, New York. Mine office: Hillsboro, Sierra Co., N. M. Organized late in 1903. Wm. Buchanan, president and treasurer; J. H. Bigelow, secretary.

BINGHAM CONSOLIDATED MINING & SMELTING CO. **UTAH.**

Offices: 60 State St., Boston, Mass., and 700 McCornick Bldg., Salt Lake City, Utah. Mine office: Bingham Canyon, Salt Lake Co., Utah. Smelter office: Murray, Salt Lake Co., Utah. Organized April 5, 1901, under laws of Maine, with capitalization $10,000,000, shares $50 par, non-assessable and full paid; issued, $7,500,000. Succeeded the Bingham Copper & Gold Co., organized 1898. Edw. L. White, president; Herbert W. Wesson, secretary; O. E. Weller, treasurer; Duncan McVichie, manager; Jos. A. Coram, O. P. Posey, John W. Weeks, E. L. White, C. K. McCornick, W. S. McCornick, Peter L. Kimberly, W. F. Hammett, L. T. Trull and Wm. Bayly, directors; B. W. Rogers, mine superintendent; W. H. Nutting, smelter superintendent; H. G. Heffron, purchasing agent and ore buyer. Lands, about 300 acres, in the Bingham or West Mountain district, including the Dalton & Lark, Antelope, Brooklyn, Commercial, Miner's Dream, Sampson, Old Hickory, Vernard, Bingham and sundry other mines and claims. Company also owns an interest of 231,500 shares in the Tesora mine, of the Tintic district, and about 190,000 shares out of 250,000 in the Eagle & Bluebell property, latter bought late in 1903, and is said to have taken a 2-year bond on the Peacock, Bluejay and adjoining properties in the Seven Devils district, in October, 1903, at a price of $525,000. The Bingham properties have a considerable variety of ores, principally sulphides, with gold and silver-lead values at and near surface, changing to auriferous and argentiferous chalcopyrite at depth, latter averaging 2.5% to 3% copper, with gold and silver values of about $2 per ton. Much of the ore is rich in iron, hence desirable for fluxing, as most of the Bingham district ores are highly silicious. The Mascot tunnel of the Dalton & Lark mine is 6,200′ in length, and has unwatered that mine, which shows a new and promising ore body, in addition to the old veins, and has shafts of 850′ and 1,000′, latter to be sunk to depth of 1,100′, also 4 tunnels, one with electric traction for tramming ores. The Brooklyn mine is 1,600′ deep, showing a strong vein, of 20′ to 25′ width, on the three lower levels. The Commercial mine produces 6,000 to 7,000 tons of ore monthly, yielding considerable auriferous galena, which is sold to the American Smelting &

Refining Co., for reduction. The Sampson mine, purchased in 1903, at a cost of about a $250,000, yields auriferous galena and argentiferous and auriferous chalcopyrite, and has given assays of 13% copper, 25 oz. silver and $2.50 gold per ton from a 4' vein. A controlling interest in the Tesora mine in the Tintic district, was acquired at a cost of about $200,000—apparently a poor investment.

The smelter, at Murray, 13 miles from the mine, was blown in January 31, 1901. The building is 150x400' in size, with steel frame on stone foundations, steel and cement floors and iron sides and roof, the only wood in the smelters being the ore-bin partitions. Plant is terraced, allowing the handling of material by gravity. There are four 200-ton 42x172" water-jacket blast furnaces, of which 3 are in commission regularly, smelting about 15,000 tons of ore monthly. The smelter has both steam and electric power, with a 1,000-h. p. Rarig blowing-engine, Stirling water-tube boilers and automatic stokers. The pyritic smelting system is used, ores being smelted to low grade matte and resmelted with silicious sulphides, producing a matte of 30% to 35% in tenor, which is blown up to blister copper averaging 98.35% in tenor and carrying average gold and silver values somewhat greater that the value of the copper itself. The construction of a lead stack is under consideration. Adjoining the smelter building is a 375' dust chamber, with a 200' steel smokestack, 12' in diameter. The conversion plant has six 10-ton shells, 7x10' 6", with 2 stands. There is also a 100-ton briquetting plant, for flue dust. The company has favorable smelting contracts with the Boston Consolidated and other properties.

The Bingham was making about 1,000,000 lbs. of copper monthly at the close of 1903, at a profit of about $50,000, and the earnings are being put back into the property in acquiring additional lands, opening new mines and improving the plant. The Bingham is a well handled property and should prove highly profitable. Shareholders who are clamorous for dividends should take into consideration the fact that the profits put back into the property add far more to its ultimate value than they could if paid out as dividends. The dividends will come a little later.

BINGHAM COPPER-GOLD MINING CO. UTAH.

Mine office: Silver City, Juab Co., Utah. James Creighton, superintendent. Ores carry gold, silver and copper. Has steam power and a 100-ton concentrator, employing about 50 men.

BINGHAM COPPER BOY MINING CO. UTAH.

Office: 14 West First South St., Salt Lake City, Utah. Mine office: Bingham Canyon, Salt Lake Co., Utah. Organized under laws of Utah, with capitalization $1,000,000, shares $1 par. C. W. Morse, president; A. Hanauer, Jr., vice-president; J. H. Hurd, secretary; J. B. Taylor, superintendent. Lands, 11 claims, area 160 acres, in the West Mountain and Tooele districts, showing several veins, carrying ores of copper, lead, silver and gold, some of which have given assays up to $90 per ton. Ore on the dump assays 2% to 4.5% copper. Is developing by an 800' crosscut tunnel and a lower tunnel of 2,000', showing 3 different veins, with nearly a mile of underground oper ings. Also owns the Great Divide group of 33 claims, area 526 acres, with 1,200′ of underground openings, showing large bodies of low-grade ore. Company is said to plan building a concentrator. Management is good and the property is considered promising.

BINGHAM & EASTERN MINES CO. UTAH.

Office: 42 Church St., New Haven, Conn. Mine office: Bingham Canyon, Salt Lake Co., Utah. Is the old Bingham & Eastern Copper Co., or old Bingham & Eastern Mining Co., or old Bingham & Eastern Copper Mining Co., or words to that effect, reorganized with present title in 1903 under laws of New Jersey, with a reduction of capital from $1,000,000 to $200,000. Lands include the Jersey Blue, I X L, Little Cottonwood and other mines, which have been occasional shippers during the past 15 years, and are opened by a 1,400′ tunnel. Property is well located and if actively developed may make a mine.

BINGHAM & EASTERN MINING CO. UTAH.

Office: 42 Church St., New Haven, Conn. See Bingham & Eastern Mines Company.

BINGHAM NEW HAVEN COPPER & GOLD MINING CO. UTAH.

Office: care of Lewis E. Stoddard, president, New Haven, Conn. Mine office: Bingham Canyon, Salt Lake Co., Utah. D. W. Farnham, secretary and treasurer; F. Benedict, superintendent. Lands, 20 claims, area about 400 acres, adjoining the Utah Consolidated and including the Zelnora mine, which has been a considerable producer. Ores carry copper, gold, silver and lead. Idle at last accounts.

BINGHAM & SALT LAKE MINING CO. UTAH.

Letter returned unclaimed, from former office, 64 East Second St., Salt Lake City, Utah.

BINGHAM WEST DIP TUNNEL CO. UTAH.

Office: care of Louis Le Vinne & Co., Providence, R. I. Apparently fraudulent.

BIRD, McCABE & KING. MONTANA.

Mine office: Corbin, Jefferson Co., Mont. Are said to have acquired by location and purchase 175 mining claims in the Corbin district, and to be sinking three 2-compartment shafts upon claims showing outcrops of bornite and chalcopyrite.

BIRTHDAY COPPER SYNDICATE. TASMANIA.

Owns 510 acres of mineral lands, carrying a fair showing of copper ore, near the coast and about 20 miles from Macquarie Heads, Tasmania.

BISBEE CONSOLIDATED COPPER CO. ARIZONA.

Office and mine: Bisbee, Cochise Co., Ariz. Employs 10 men. R. L. Samuel, president and general manager; Emil Marks, vice-president; F. A. Hess, secretary; W. J. Lewis, treasurer. Organized 1902, under laws of Arizona, with capitalization $1,000,000, shares $5 par; unissued, $100,000. Lands, 18 claims, area, 360 acres, northwest of the Copper Glance, in the Warren district, showing a heavy conglomerate capping over limestone, opened by a 150′ shaft. Has steam power and 54-h. p. hoist, good for depth of 1,500′. Is only a half mile from El Paso & Southwestern Railway, and will continue sinking in 1904.

BISBEE GOLD & COPPER MINING CO. ARIZONA.

Office and mine: care of M. R. Harlan, Bisbee, Cochise Co., Ariz. Lands adjoin the Modern mine.

BISBEE-ARIZONA GOLD & COPPER MINING CO. ARIZONA.

Office and mine: care of C. T. Clark, vice-president and general manager, Bisbee, Cochise Co., Ariz. M. D. Scribner, president; Jacob Schmidt, treasurer; Frank H. Bopp, secretary. Organized Dec. 27, 1902, under laws of Arizona, with capitalization $1,000,000, shares, $1 par. Lands, 6 claims, area, 120 acres, 7 miles northwest of Bisbee, near the Modern. Has a 100′ shaft with steam hoist.

BISBEE BELLE COPPER CO. ARIZONA.

Office: 401 Laughlin Bldg., Los Angeles, Cal. Mine office: Wickenburg, Maricopa Co., Ariz. Organized under laws of Arizona, with capitalization $1,250,000. Geo. M. Case, president; Geo. Van Derwerker, secretary. Lands, 25 claims, in the Wickenburg district, opened by 4 shafts, deepest 150′, and a 600′ tunnel, showing ores giving assays up to 30% copper and $2 gold per ton, with traces of silver.

BISBEE QUEEN DEVELOPING CO. ARIZONA.

Office and mine: care of B. F. Graham & Co., Bisbee, Cochise Co., Ariz. Organized April 20, 1903, under laws of Arizona, with capitalization $1,000,000, shares, $5 par. Lands, 27 claims, lying between the Portage Lake & Bisbee and Pittsburg & Hecla.

BISBEE & SUPERIOR DEVELOPMENT CO. ARIZONA.

Company located 28 claims in the Modern district, Upper Tombstone Canyon, Bisbee, Ariz., early in 1903, but went into voluntary liquidation a few months later, surrendering the claims and refunding all subscriptions to stock.

BISBEE WEST COPPER MINING CO. ARIZONA.

Office: Los Angeles, Cal. Mine office: Bisbee, Cochise Co., Ariz. Organized Oct. 25, 1899, under laws of Arizona, with capitalization $4,000,000, shares $1 par. A. S. Robbins, president; Fred. L. Dwight, superintendent; James Smith, foreman. Lands, about 440 acres, in the extreme western part of the Warren district. First shaft has been temporarily abandoned, owing to great quantity of water inflowing, and a second shaft is now being sunk, nearer to the properties of the Wolverine & Arizona and Red Jacket & Bisbee companies.

KUPFERERZ-GEWERKSCHAFT BISMARCK. GERMANY.

Office: Hanover, Germany.

BISMARCK-NUGGET GULCH CONSOLIDATED MINING CO. MONTANA.

Office: Stock Exchange Bldg., Chicago, Ill. Mine office: Brandon, Madison Co., Mont. Louis D. McCall, president. Capitalization, $5,000,000. Lands, 17 copper claims and 18 gold claims, in 3 groups, the copper claims being on Stone Creek, in the Ruby Mountains. Has a 60-ton concentrator and 30-ton smelter. At present confines attention to gold mining, although its copper claims are said to be promising.

BISON MOUNTAIN MINING CO. MONTANA.

Mine office: Elliston, Deer Lodge Co., Mont. Ores carry gold, silver, copper and lead. Has steam power and employs 10 men.

BITTER ROOT COPPER MINING CO. MONTANA.

Lost its lands through inability to meet bond payments.

BLACK COPPER CO. NEW MEXICO.

Mine office: Elizabethtown, Colfax Co., N. M. A gold producer only.

BLACK BAY MINING CO. ARIZONA.

Office: Willmar, Minn. Employs 9 men. G. P. Carwand, president; N. B. Carlson, secretary. Organized November 5, 1901, under laws of Arizona, with capitalization $1,000,000. Lands, 3 crown-granted claims, area 266 acres, also 13 acres miscellaneous lands, all heavily timbered, in the Thunder Bay district of Algoma, Ontario. Country rock is trap, showing 7 amygdaloidal cupriferous beds, claimed by company to average 2% native copper, 1.25 oz. silver and $2 gold per ton. Company plans installing steam power and exploring with a diamond drill in 1904.

BLACK BESS MINE. UTAH.

Located in the Big Cottonwood district of Utah. Is understood to have made small shipments of copper and lead during 1903.

BLACKBIRD COPPER & GOLD MINING CO. IDAHO & UTAH.

Office: 519 Dooly Bldg., Salt Lake City, Utah. Mine offices: Salmon, Lemhi Co., Idaho, and Frisco, Beaver Co., Utah. J. W. Russell, president; D. W. Kimball, secretary and treasurer; Dr. P. A. H. Franklin, manager; Geo. S. Fitzwater, superintendent in Idaho; Peter M. McCrea, superintendent in Utah. Lands, 27 patented claims and sundry locations in Idaho, latter having steam power and employing 15 to 20 men and having made smelter shipments returning 17% copper and $8 gold. Utah lands are 42 patented claims and 61 claims held by location, total area about 2,000 acres, adjoining the Cactus mine of the Newhouse company, on which a large shaft has been started. Company plans changing its name to Beaver Valley Copper Co. Considerable development has been secured and the property is regarded as promising, especially the Utah holdings.

BLACK CANYON COPPER CO., LTD. ARIZONA.

Office: 13 Mills Bldg., San Francisco, Cal. Branch office: 315 Fleming Blk., Phoenix, Ariz. Mine office: Mayer, Yavapai Co., Ariz. Dr. O. A. Lindstrom, president; Chas. E. Nathhorst, vice-president and general manager; K. M. Lundberg, secretary and treasurer. Organized under laws of Arizona, with capitalization $1,000,000, shares $5 par. Lands, 5 claims, area 100 acres, in the Black Canyon district, showing auriferous and argentiferous oxide, carbonate and sulphide ores, and a little native copper, developed by a 125′ tunnel and several shallow shafts and open cuts.

BLACK CHIEF MINE. ARIZONA.

At Dewey, Yavapai Co., Ariz. Timothy Fell, owner. A prospect on which a limited amount of development work has been done.

BLACK DIAMOND COPPER CO. · **BRITISH COLUMBIA.**

Office: 604 Land Title Bldg., Philadelphia, Pa. Maxwell Stevenson, president; Henry M. Stevenson, secretary. Lands are in the Ainsworth district of British Columbia, and company is driving a continuation of the Highlander tunnel, having a total length of about 3,000′, which has cut 3 veins of 4′ to 13′, giving fair assays in silver, lead, copper and gold. Officers are men of good standing, but the company's advertising is too strong.

BLACK DIAMOND COPPER MINING CO. **ARIZONA.**

Office: 99 John St., New York. Mine office: Pearce, Cochise Co., Ariz. Organized 1898, under laws of West Virginia, with capitalization $2,000,000, shares $5 par. Employs 50 men. E. D. Kennedy, president and general manager; Henry O. Christy, vice-president; Dr. T. M. Sabin, secretary; Chas. Brandon, mine superintendent; C. H. Gracy, smelter superintendent. Lands, 35 claims, area about 500 acres, 6 miles from Pearce, in the Cochise mountains. Ores occur as contact veins between limestone and porphyry, with parallel dykes of sandstone and quartzite, having a heavy gossan capping, in places 150′ wide. Ores are mainly chalcopyrite and bornite, with iron and silica gangue, estimated to average better than 6% copper, 10 oz. silver and $1.40 gold per ton, with about 38% of silica. Ores are exclusively sulphide, almost from grass-roots, very little oxide or carbonate ore being noted. Property was opened originally for silver. Development is by 4 tunnels, lowest 600′ below crest of the hill, tunnels being connected by winzes. A new ore chute, 11′ wide, gives assay of 10% copper and 35 oz. silver, with a 2′ paystreak assaying 26% copper and 400 oz. silver ter ton. Company plans sinking a 1,000′ shaft, which is advisable, as the mine lacks depth. Mine is connected with smelter by a 1½ mile Leschen aerial tramway having a drop of 800′, with 600 tons daily capacity. Operation of property has been much hampered by dry seasons, but in 1903 a pumping plant with 4″ pipeline, was installed at Pearce, this having capacity to raise 100,000 gallons daily against a head of 804′ in 6 miles. There is a 350,000-gallon storage reservoir at the mine. Property has a good steam equipment, including two air-compressors with 15-drill capacity, and petroleum is used for fuel. A branch of the Southern Pacific Railway to Pearce effects a large saving in freight. Miscellaneous improvements include a 20-room hotel, store, schoolhouse and a considerable number of dwellings.

The 200-ton smelter built in 1902 was blown in and blown out twice in 1903. At end of year planned blowing in again early in 1904. This has a 44x120″ Allis-Chalmers rectangular water-jacket blast furnace, a 38″ auxiliary cupola and a 24x36′ circular roaster, treating about 150 tons daily, and making a matte carrying about 65% copper, and 150 oz. to 300 oz. silver per ton, with small gold values, which is shipped to the New York Metal Company for reduction and refining. Ores are self-fluxing, and easily smelted, and furnace shows slag losses of only 0.3% copper.

BLACKFOOT COPPER CO.

Address unknown. Property ditto. Stock was sold in the east by **Morrill**

Smith & Co., 7 Water St., Boston, Mass. No returns secured and stock presumably worthless.

BLACKFOOT MINING & MILLING CO. WYOMING.

Property supposed to be in the vicinity of Battle, Carbon Co., Wyo. H. M. Shields, superintendent, at last accounts.

BLACK FOREST GROUP. NEVADA.

Mine office: Wells, Elko Co., Nev. C. M. Spence, owner and manager. Ores carry copper, gold, silver and lead. Has water power and a small smelter.

BLACK HILLS COPPER CO. SOUTH DAKOTA

Office: Benton Harbor, Mich. Mine office: Rochford, Pennington Co., S. D. Organized under laws of South Dakota, with capitalization $2,000,000, shares $1 par. John E. Barnes, president; Geo. D. Thresher, secretary; J. B. Taylor, superintendent. Lands, 510 acres, opened by slope-tunnel and 800′ crosscut. Has a vein of 50′ and upwards, carrying oxide and carbonate ores giving average values of 1.5% to 3%, with assays up to 16% from selected ore, and small values in gold, silver and nickel. Company considered to have an honest management.

BLACK HILLS COPPER CO., LTD. ARIZONA.

Office: 516 Grant Bldg., Los Angeles, Cal. Mine office: Jerome, Yavapai Co., Ariz. Employs 5 to 10 men. R. A. Thomas, president; J.R. Thomas, secretary and treasurer; Ed. Beven, superintendent. Organized July, 1899, under laws of Arizona, with capitalization $3,000,000, shares $1 par. Lands, 14 claims, area 260 acres, in the Verde district, opened by a 352′ vertical main shaft, and a 212′ incline, with tunnels of 225′, 391′, 363′ and 1,002′. Has steam power, air compressor and necessary mine buildings.

BLACK HILLS GOLD & COPPER MINING CO. ARIZONA.

Office: care of R. H. Burmister, general manager, Prescott, Yavapai Co., Arizona.

BLACK HILLS & DULUTH COPPER MINING CO. SOUTH DAKOTA.

Mine office: Custer, Pennington Co., S. D. Capitalization $3,000,000, shares $1 par. F. A. Towner, president; M. J. Bailey, secretary; W. A. Nelson superintendent. Lands, 340 acres, adjoining the Central Black Hills Copper Co., showing promising outcrops of argentiferous and auriferous copper ores, which have given assays up to 20% copper. Has water power and limited development by two shafts.

BLACK MARIA & SILVER BELLE MINES. IDAHO.

Mine office: Mineral, Washington Co., Idaho. A. J. Crook, superintendent at last accounts. Mine opened by tunnel and shaft. Ores carry copper and silver; has steam power and a 20-ton smelter.

BLACK PEAK GOLD & COPPER MINING CO. NEW MEXICO.

Has 6 claims, with about 2,000′ of development work, said to show about 5,000 tons of shipping ore, in Sierra county, New Mexico.

BLACK PRINCE COPPER CO. ARIZONA.

Office: care of Chas. F. Potter & Co., Minneapolis, Minn. Letters returned unclaimed from former mine office, Pearce, Cochise Co., Ariz. Lands, 7 claims, area 140 acres.

BLACK ROCK MINE. **MONTANA.**

Office and mine: care of Hon. W. A. Clark, Butte, Silver Bow Co., Mont. Was formerly an important silver producer, and is being reopened for copper.

BLACK ROCK GOLD & COPPER MINING CO. **ARIZONA.**

Office: West Superior, Wis. Mine office; Dewey, Yavapai Co., Ariz. A. D. Bellinger, president and general manager; Prof. J. A. Merrill, secretary; W. D. Powell, superintendent. Capitalization $700,000, shares $1 par. Main shaft about 150′, on vein of 5′ to 8′ giving assays of $20 to $80 per ton, from auriferous and argentiferous copper ores. Has steam power, with good prospecting equipment. Management considered energetic and honest.

BLACK TIGER MINE. **COLORADO.**

Mine office: Red Cliff, Eagle Co., Colo. J. F. Fleming, superintendent. Was driving a tunnel to develop ores carrying gold, silver and copper, at last accounts.

BLACK TIGER COPPER MINING CO. **WYOMING.**

Mine office: Encampment, Carbon Co., Wyo. Capitalization $1,000,000, shares $1 par. Fennimore Chatterton, president; Bernard McCaffrey, secretary. Lands, about 103 acres. Officers are men of excellent standing, but the eastern promoters seem to have been little hampered by the truth in selling this stock.

BLACK WARRIOR GROUP. **BRITISH COLUMBIA.**

Letter returned unclaimed from Alberni, Vancouver Island, B. C. Owned by A. Watson, et al. Slightly developed by tunnel and open-cuts. Has secured assays of 15% copper, $3 silver and $2 to $12 gold per ton.

BLACK WARRIOR COPPER COMPANY, AMALGAMATED. **ARIZONA.**

Office: 1420 Chestnut St., Philadelphia, Pa. Mine office: Black Warrior, Gila Co., Ariz. James A. Fleming, president and general manager; Ernest L. Tustin, secretary; Richard Fleming, mine superintendent; Nicholas Taylor, smelter superintendent; D. H. Benson, superintendent of acid plant. Capitalization was increased, November, 1902, to $2,500,000, shares $10 par. Has expended upwards of $500,000 in development of the mine and plant. Lands, 1,500 acres, in 3 groups, the Gold Gulch, Diamond H. and Montgomery, latter including the Montana and Dadeville mines, adjoining claims opened by tunnels of 1,000′ and 1,200′, with about 3,000′ of underground openings showing a vein of 20′ to 60′ width, carrying silicious ores assaying up to 6% copper. Development was begun in 1895. Has a steam plant, burning petroleum. Reduction plant includes a 50-ton matting furnace and 10-ton refining furnace, and it is stated that order has been placed for a 100-ton blast furnace. Has a 100-ton concentrator and a 250-ton leaching plant, latter having six 50-ton square tanks, each 20x25′ and 5′ in depth, in a building 62x130′. Tanks are heated by steam coils, which considerably facilitate the lixiviation of copper values. Crushed ore is delivered to tanks from a railroad track running above, which is to be replaced by a belt conveyor. While this property has large ore bodies, and has expended great sums in development, it has never become a steady producer. Work was started again in May, 1903, and suspended in June. From 75 to 100 men are employed when the property is running, which is but a small part of the time. A fight is on among the directors at the close of 1903. The property may be valuable, and perhaps is, but its operations for the past eight years have been of a most disappointing nature, and the great promises originally made have been redeemed only in excuses for repeated failures.

BLANCHE MINE. **NEW MEXICO.**

At Organ, Donna Ana Co., N. M. Owned by W. H. Mackay, Jr.

BLANCHE COPPER MINING CO. **WYOMING.**

Office: 432 Omaha National Bank Bldg., Omaha, Neb. Mine office: Encampment, Carbon Co., Wyo. Employs 5 men. H. E. Owen, president; Jas. H. Kyner, secretary; A. H. Crow, general manager. Organized April 2, 1902, under laws of Wyoming, with capitalization $1,000,000, shares $1 par. Lands, 5 claims near the New Rambler, on which a slight amount of development work shows two veins, one of which, 3′ to 5′ wide, shows auriferous oxide, carbonate and sulphide ores. Management contemplates installation of a machinery plant.

BLAND MINE. **ARIZONA.**

Mine office: Patagonia, Santa Cruz Co., Ariz. Powers, Clark & Heck, owners. Was driving a tunnel to develop ores carrying copper, silver and gold, at last accounts.

BLAYNEY MINING & SMELTING CO. **AUSTRALIA.**

Mine office: Blayney, N. S. W., Australia. S. Remfry, manager. Capitalization £100,000. Lands, 50 freehold claims, including the mine variously known as the Blayney, Great Blayney and Annandale, reopened in 1897 by the present owners. Has a 40′ vein, carrying chalcopyrite disseminated in andesite, opened by a 390′ shaft. Has steam power and a 50-ton smelter with 2 water-jacket furnaces. Produced 418 long tons of copper from 18,666 tons of ore smelted in 1901.

BLEDSOE GOLD MINING & LEACHING CO. **COLORADO.**

Mine office: Kokomo, Summit Co., Colo. Henry Pomeroy, superintendent. Ores carry gold, silver, lead and copper.

BLINMAN COPPER MINING CO. **AUSTRALIA.**

Office: 107, Queen St., Melbourne, Victoria, Australia. J. M. Higgins, manager. Operates the Blinman mine, in the Flinders range, South Australia, about 270 miles north of Adelaide. Mine opened 1862, reopened circa 1899. Deepest shaft, 450′. Ore averages 8% copper, as mined, and is concentrated to 23% for shipment to smelter, hand-picked ores ranging 30% to 40%. District is arid, causing much trouble from inadequate water supply. Employs about 75 men. Annual capacity, about 1,250,000 lbs. refined copper.

BLUE ACRE COPPER CO. **UTAH.**

Office: 409 Dooly Blk., Salt Lake City, Utah. Mine office: Blueacre, Beaver Co., Utah. Employs about 10 men. Capitalization $600,000, shares $1 par. Henry M. Crowther, president and general manager; Wallace W. Wait, vice-president, secretary and treasurer. Lands, 17 claims, area 320 acres, in the Beaver Lake district, showing 5 contact and fissure veins, of which three of good average width are being opened, with estimated values of

6% copper, 5 oz. silver and $4 gold per ton from oxide, carbonate and sulphide ores, opened by 3 shallow shafts. Property regarded as promising, though but slightly developed.

BLUEBELL MINE. **ARIZONA.**

Mine office: Johnson, Cochise Co., Ariz. Weir & Mitchell, owners; T. K. Mitchell, superintendent. A prospect on which a limited amount of development work has been done.

BLUE BELL COPPER MINING CO.

Office: 36 Swiss St., Cleveland, Ohio. No replies to repeated requests for information.

BLUE BELL MINING CO. **CALIFORNIA.**

Address: care of J. J. Sullivan, Quincy, Cal. Lands, near Hosslekuss's, Plumas county, California.

BLUE BIRD COPPER-GOLD MINING CO. **UTAH.**

Office: care of M. J. True, secretary and general manager, Salt Lake City, Utah. Mine office: Milford, Beaver Co., Utah. Lands are near the Hickory group of the Majestic company. Main shaft, 275′. Property thought to be valuable, but company in financial straits at last accounts.

BLUE BIRD MINING & SMELTING CO. **WASHINGTON.**

Mine office: Darrington, Snohomish Co., Wash. Was driving a tunnel, with Thos. Parks, superintendent, at last accounts.

BLUE CREEK COPPER MINING CO. **WASHINGTON.**

Letter returned unclaimed from former office, Spokane, Wash.

BLUE GROUSE CLAIMS. **BRITISH COLUMBIA.**

Lands adjoin the Yreka on the southeast.

BLUE HILL COPPER MINES. **MAINE.**

At Blue Hill, Me. An unsuccessful property. Idle many years.

BLUE JACKET MINE. **IDAHO.**

Mine office: care of Frank E. Johnesse, operator under bond and lease, Grangeville, Idaho Co., Idaho. Lands, 4 unpatented claims, area 75 acres, showing 2 contact veins of great width, assaying 4% copper, 7 oz. silver and $4 gold per ton. Ores are oxides near surface and sulphides at depth. Shafts, 100′ to 300′ deep, with 1,000′ of underground openings. Has gasoline power.

BLUE JACKET CONSOLIDATED COPPER CO. **IDAHO.**

Office: 20 Broad St., New York. Mine office: Decorah, Washington Co., Idaho. Lands, 295 acres, in the Seven Devils district, with steam power and 30-ton smelter. In financial straits at last accounts.

BLUE JAY MINE. **CALIFORNIA.**

Letter returned unclaimed from Redding, Shasta Co., Cal. Property is 4 miles north of Redding and 3 miles from Keswick, showing sulphide ores and a little native copper, in a 30″ vein traceable 1,000′ and opened by a shallow shaft.

BLUE JAY MINE. **NEVADA.**

Mine office: Yerington, Lyon Co., Nev. A. Pugh, superintendent. Was sinking shaft and driving tunnel, with steam power and small force, at last accounts.

BLUE JAY GROUP. **UTAH.**

Office: care of John Skewes, owner, Salt Lake City, Utah. Lands are in vicinity of Moab, Grand Co., Utah. Main shaft, about 100′, shows ore assaying up to 25% copper.

BLUE JAY MINING CO. **CALIFORNIA.**

Mine office: Letcher, Fresno Co., Cal. N. Phillips, superintendent, at last accounts.

BLUE LAKE GOLD & COPPER MINING, SMELTING & POWER CO. **WASHINGTON.**

Office: 302 Wisconsin St., Wilwaukee, Wis. Mine office: Conconully, Okanogan Co., Wash. C. T. MacElroy, secretary and general manager. Has 6 veins, ranging 1′ to 3′ wide, giving assays of 3% to 49% copper and $3 to $11 gold per ton.

BLUE LEDGE MINE. **CALIFORNIA.**

Office: care of B. C. Kingsbery, Spokane, Wash. Lands, 13 claims, area 260 acres, at the head of Joe Creek, Siskiyou county, California, about 4 miles south of the Oregon line, carrying a 20′ contact vein between white and black mica-schists, opened by 3 tunnels, longest 80′, showing chalcopyrite and a little native copper, with average assay values of about 4% to 5% copper and 8 oz. silver per ton. Supposed to be under bond to Clark and Kingsbery, of Spokane, Wash.

BLUE LEDGE COPPER CO. **OREGON.**

Letter returned unclaimed from Applegate, Jackson Co., Ore. Ores carry copper, gold and silver. Has steam power and employs about 10 men when working.

BLUE WING MINE. **NORTH CAROLINA.**

Mine office: Baker City, Granville Co., N. C. Owned by John T. Williams, of New York. Property was formerly held by the Blue Wing Copper Co., and later by the Boston & Carolina Copper Mining Co. Never successful, owing to bad management, until taken by Mr. Williams, and again idle.

BLUE WING COPPER CO. **NORTH CAROLINA.**

Succeeded by Boston & Carolina Copper Mining Co.

GEWERKSCHAFT BOBERTHALER ERZBERGWERKE. **GERMANY.**

Mine office: Kupferberg, Schlesien, Germany.

BOBTAIL MINE CO. **ARIZONA.**

Office: presumably Minneapolis, Minn. Mine office: Globe, Gila Co., Ariz. Lands, 20 claims. F. D. Adams, superintendent, at last accounts.

BOCCHEGIANO MINE **ITALY.**

Operated by Societe Anonima delle Miniere di Montecatini.

BOGOSLOVSKI MINES. **RUSSIA.**

Office: care of Baron K. M. Keldt Von Turgensburg, Perm, Russia. Mine office: Bogoslovsk, Perm, Russia. Property includes 3 mines and is one of the largest copper producers of the empire. Ores occur generally in contact veins between limestone and intrusive igneous rocks, and include oxides, carbonate, chryscolla, etc., in the surface zone, with chalcopyrite and bornite in the zone of secondary enrichment, and chalcopyrite in association with iron pyrites and magnetite, with calcareous and quartz gangue, at depth. Has a smelter at Bogoslovsk, near the mines, and produces blister copper. Latest reported production was 2,634,767 lbs. refined copper in 1899.

COMPAGNIE DU BOLEO. MEXICO.

Offices: Rue de Provence, 56, Paris, France. American office: 614 Sansome St., San Francisco, Cal. Mine office: Santa Rosalia, Baja California, Mex. Employs 2,800 men. E. Puerari, chairman; P. Miribaud, administrateur-delegue; Ch. LaForgue, director general; M. Demarest, secretary; W. W. Rose, general mine superintendent. Organized 1885, under laws of France, with capitalization 12,000,000 francs; debentures, 1,782,000 francs, in bonds of 500 fr., bearing 4.5% interest. Profits of company in 1902 were 1,750,961.08 francs, an increase of 544,705.48 francs over 1901, and for 1903 were probably materially larger. Dividends for 1901 and 1902 were 62 francs 50 centimes for each year. Company is supposed to be controlled by the French house of Rothschild. Enjoys, for a period of 20 years, ending Dec. 17, 1912, exemption from all federal and local taxes except stamp taxes; exemption of employes from military and civil service, and exemption from customs duties and local dues, and for a term of 50 years, expiring 1942, is exempt from export duties on copper produced and import duties on fuel consumed.

Mineral lands are 11 groups, including 3 principal groups of mines known as the Soledad, Providencia and Purgatorio, also 11,920 hectareas of grazing lands, south of the mines. The ore occurs in a formation of Tertiary conglomerates, sandstones and tufas, traversed at certain points by trachyte, the cupriferous tufas overlying conglomerates of eruptive rock pebbles, and being surmounted by argillaceous tufas, all traversed by fissures. The ores are of great variety, including cuprite, melaconite, azurite, malachite, crednerite, chrysocolla, atacamite, covellite and chalcocite. There are three cupriferous beds, of which the upper averages about 3′ in thickness, the middle 2′ to 3′, and the bottom bed 2′ to 10′. The middle bed carries oxide and carbonate ores in oölitic concretions, known locally as boleos, hence the name of the mine. The lowest bed is partially below the water line and carries sulphide ores, as well as oxides and carbonates. The ore is disseminated through the tufas in thin, irregular veins with clay gouge, and has a marked concentration toward the bottom of each bed, where the ore forms compact layers of 6″ to 12″. The main workings are 15 metres to 200 metres above sea level, the mine being opened by numerous tunnels, and by 7 shafts of the following depths: Sombrero, 98 metres; Carmen, 53m.; Purgatorio, 55m.; Central, 156m.; Amelia, 48m.; Santa Rita, 86m.; San Juan, 85m.; The mine is extensively developed, having about 122,000 metres of underground openings in service.

The mine has complete steam and electric plants, including electric locomotives, generating about 2,000 h. p. from steam engines, of which 1,500 h. p. is transformed by three-phase dynamos for distribution to the various mines. Owing to the peculiar nature of the mine all drilling is done by hand, and owing to the richness of the ore no mechanical concentration is attempted, hand-sorting being deemed sufficient. The smelting plant was rebuilt in 1901 and has eight 150-ton water-jacket furnaces. The ore is smelted to a matte of 58% to 65% tenor, and about one-third of the matte is reduced to black copper of 89% to 94% in tenor, both matte and bars being shipped to Germany for refining. German coal is used for smelting and coal briquettes for general fuel. The average net copper return of ore smelted was 4.29% in 1900, 3.95% in 1901 and 4.38% in 1902. Ore is hand-sorted and machine-briquetted, at a cost of only one franc per ton, the argillaceous gangue serving as a natural binder.

The climate is tropical and the country extremely arid. Potable water is secured by a 17,000-metre pipe-line from a reservoir on the Yaqui plateau, with pumps at Santa Aguede and Santa Rita. There is also a condensing plant, with 4 powerful pumps, for the distillation of sea water. A private railroad of 30 kilometres connects the mines with the smelter at Santa Rosalia, the road having 9 locomotives and 120 cars. At the port of Santa Rosalia, opposite Guaymas, Sonora, is a town of 7,000 people, dependent solely on the mines and smelter. The company has a 340-metre jetty, and owns a sailing vessel of 350 tons register. Miscellaneous enterprises include several general stores, a sawmill, four schools and a hospital. Wages are $1.25 per day, Mexican, for common labor, with free water and medical attendance, but owing to much higher wages being paid on the mainland, across the Gulf of California, the Boleo is suffering from a scarcity of labor, and had arranged to import 2,000 Chinese coolies, but a director of the company informs me that this cannot be done, owing to objections of both the Chinese and Mexican governments. The production of refined copper in 1902 was 10,953 metric tons, made from 249,895 tons of ore, and for the first half of 1903 the production of refined copper was 5,022 metric tons, a small gain over the preceding year. The Boleo is a very valuable mine, and well managed, good results being secured notwithstanding the many serious drawbacks found in operation.

BOLINAS COPPER MINING CO. **CALIFORNIA.**

Office: 253 Spear St., San Francisco, Cal. T. P. H. Whitelaw, president and manager. Owns copper property showing 9 veins, 6″ to 2′ wide, in serpentine, 4 miles northeast of Bolinas Bay, Marin Co., Cal., on which considerable development work has been done. Ore on the dumps is said to carry 5% to 10% copper. Has a good equipment, including concentrator. Idle at last accounts and company refuses to furnish any statement.

BOLIVIAN COMPANY. **BOLIVIA.**

Organized circa 1901, by Sir Martin Conway. Holds important mining concessions from the Bolivian government, on the basis of royalty of one-third of net profits. Has concession of 10,000 square miles, between the Andes and headwaters of the Amazon.

BOMPA SYNDICATE. **AUSTRALIA.**

A local company that is developing a copper property at Glasford Creek, Gladstone district Queensland, Australia. Showing said to be promising, but district lacks railway connections, which must be had before it can become a considerable producer.

BONANZA MINING CO. **BRITISH COLUMBIA.**

Office: Fort Simpson, B. C. Lands are in the Cassiar district. Idle.

BONANZA MINING CO. **WASHINGTON.**

Letter returned unclaimed from Index, Snohomish Co., Wash.

BONANZA MOUNTAIN GOLD MINING CO., LTD. **BRITISH COLUMBIA.**

Mine office: Grand Forks, B. C. F. H. Knight, superintendent. Has low-grade auriferous and argentiferous copper ores, and employed about 10 men in development work at last accounts.

BONANZA QUEEN MINING CO., LTD. **WASHINGTON.**

Office: Minneapolis, Minn. Mine office: Silverton, Snohomish Co., Wash. Richard H. Harehold, superintendent. Lands, 8 claims, showing 4 veins carrying auriferous copper ores. Has about 1,200′ of underground openings and employs about 20 men.

BONNER MINE. **ONTARIO.**

A group of claims on Michipicoten Island, Algoma, Ontario.

BONNY BELLE MINING & MILLING CO. **WYOMING.**

Said to have had 2 claims near the Ferris-Haggarty mine, in the Encampment district of Wyoming. Company moved office from 100 Washington St., Chicago, Ill., and left no address.

BOODLE MINING SYNDICATE, LTD. **COLORADO.**

Offices: 46, St. Mary Axe, London, E. C., Eng. Mine office: Central City, Gilpin Co., Colo. John Peter Reid, chairman; Chas. Pearson, secretary; W. J. Richards, superintendent. Capital, nominal, £15,000; issued, 7,500 shares, 15s. called up. Ores carry gold, silver and copper. Has steam power. Idle.

BORNITE COPPER & GOLD MINING CO. **ARIZONA.**

Office: 16 State St., Boston, Mass. F. Rockwood Hall, president; Geo. D. Coleman, secretary and treasurer; W. G. Gates, superintendent. Lands are on Cram Mountain, Maricopa county, Arizona. Property is idle and the company is unable to pay its bills.

BORNITE COPPER & GOLD MINING CO. **WASHINGTON.**

Lands, 11 claims in the Stillaguamish district of Snohomish County, Washington carrying auriferous bornite and chalcopyrite. Was developing with considerable vigor at last accounts.

BOSSMO KISGRUBER. **NORWAY.**

Mine office: Bossmo in Ranen, Norway. Works ores carrying 0.5% and upwards in copper, and up to 50% sulphur, latter element furnishing the principal values of the ores. Production in 1902 was about 24,000 tons of cupriferous pyrites.

BOSTON GROUP. **NEVADA.**

Near Reno, Fremont Co., Nev. Area, 110 acres. Under bond to J. K. Miller, et al., Colorado Springs, Colo., at last accounts.

BOSTON CONSOLIDATED COPPER & GOLD MINING CO., LTD. **UTAH.**

Offices: 3-4, Great Winchester St., London, E. C., Eng., and 608 Dooly Blk., Salt Lake City, Utah. Mine office: Bingham Canyon, Salt Lake Co., Utah. Employs a varying force, averaging about 50 men. John E. Dudley Ryder, chairman; Frank L. Gardner, vice-chairman; Geo. H. Johnson, secretary; M. M. Johnson, general manager; Samuel Newhouse, managing director, under six-year contract, or until the mines are on a productive basis, he to then receive a percentage of the net profits. Capital £500,000. Lands, 51 claims, area 349 acres, mainly adjoining the Highland Boy mine of the Utah Consolidated, in the Bingham or West Mountain district, title being held through an American corporation. Devolopment is by numerous tunnels, showing several ore bodies. Veins of 32′ and 50′ width were opened in 1903 by Armstrong tunnel No. 2. In 1903 the mine shipped about 600 tons of selected ore to the United States smelter, this giving returns of 8% copper, 2 oz. silver and $2.50 gold per ton. Mr. Newhouse estimates the mine to show 1,668,716 tons of argentiferous and auriferous 4% copper ore, the precious metal values averging about 4 oz. silver and $1.50 to $2 gold per ton. The Copper Belt railway is being extended to Armstrong tunnel No. 1, and will give a freight rate of 15c. per ton on ores shipped to the smelter of the Bingham Copper & Gold Co., with which company a two-year contract has been made for smelting a minimum of 200 tons daily of ore not under 3% in copper, shipments to begin with completion of the railroad. The smelter allows 10c. per unit for excess of iron over silica, and ores smelted so far have averaged about 17% excess in iron, giving the Boston Consolidated a bonus of $1.70 per ton in case the ores should hold their present proportion of excess iron. Management estimates a profit of $3 to $5 per ton on shipments to the Bingham smelter. For the fiscal year ending September 30, 1903, the company expended $49,024.05 on mine and plant. The differences between conflicting interests have been satisfactorily adjusted, and this important property bids fair to become within a short time the large and profitable producer indicated by its extensive bodies of medium-grade ore.

BOSTON GOLD-COPPER MINING CO. **COLORADO.**

Office: 15 Exchange St., Boston, Mass. Company claims to have 410 acres, with a vast amount of ore in sight, but fails to give location of the property in response to repeated inquiries.

BOSTON GOLD-COPPER SMELTING CO. **COLORADO.**

The smelter of this company, at Leadville, Colo., has been leased for a term of 10 years to the Republic Smelting Co.

BOSTON-ARIZONA MINING CO. **ARIZONA.**

Office: 46 Broadway, New York. Mine office: Morristown, Maricopa Co., Ariz. Employs 4 men. Organized 1901, under laws of Arizona, with capitalization $5,000,000, shares $1 par. Henry Livingtson Bowdoin, president; T. J. Smith, secretary; W. T. Smith, treasurer and general manager. Lands, 10 claims, area 200 acres, in the Vulture district, showing

6 fissure veins, of which two average 4′ to 20′ width, opened by 3 shafts of 20′ to 50′ and an 80′ tunnel, showing oxide and carbonate ores and giving assays of 1% to 40% copper and $1 to $22 gold per ton, with a little silver and galena.

BOSTON & BRITISH COLUMBIA COPPER CO. BRITISH COLUMBIA.

Lost title to property. Company probably dead.

BOSTON & BUTTE MINE. ARIZONA.

Letter returned unclaimed from former mine office, Gilbert, Yavapai Co., Ariz. W. H. Burrage, superintendent. A prospect on which a limited amount of work has been done.

BOSTON & CAROLINA COPPER MINING CO. NORTH CAROLINA.

Property is the Blue Wing mine, leased to John T. Williams in 1903. Mine idle and affairs tied up by litigation.

BOSTON CLIMAX GOLD-COPPER MINING & INVESTMENT CO. WASHINGTON.

Office: Union Trust Bldg., Providence, R. I. Benj. F. Harrington, president and general manager. Lands are about 240 acres in Stevens Co., Wash., on which about $25,000 has been spent in development work. Company gives no returns, but Mr. Harrington is a man of excellent standing.

BOSTON-COLBY MINING CO. MONTANA.

Office and mine: care of Martin Spikerman, Saltese, Missoula Co., Mont. Organized 1903, with capitalization $1,000,000, shares $1 par. Lands. 3 claims.

BOSTON-COLORADO COPPER MINING CO. COLORADO.

Office: 50 White St., New York. Mine office: Fort Collins, Larimer Co., Colo. Edwin M. Keiser, president; Sanford Stark, vice-president and general manager; Roger C. Turner, secretary. Employs 5 to 10 men. Organized 1899, under laws of Arizona, with capitalization $1,000,000, shares $1 par. Lands, 7 patented claims, area 63 acres, in the Howes Gulch district, showing carbonate and sulphide ores giving assays of 7% to 8% copper, 1 oz. silver and $2.60 gold per ton, developed by shafts of 40′ and 240′ and two 200′ tunnels. Has steam power and necessary mine buildings. Shipped about 500 tons of ore to the Argo smelter during 1903.

BOSTON & COLORADO SMELTING CO. COLORADO.

Office: Boston Bldg., Denver, Colo. Works office: Black Hawk, Gilpin Co., Colo. C. C. Converse, president; Geo. D. Edmunds, secretary; Harold V. Pearce, manager. Has an extensive smelting plant and refinery, equipped with steam and electric power and employing about 200 men. Paid 10% dividends until 1898, and thereafter 6% dividends until 1903, when dividend was passed.

BOSTON & DENVER CONSOLIDATED MINING & MILLING CO. COLORADO.

Mine office: Black Hawk, Gilpin Co., Colo.

BOSTON-IDAHO MINING CO. IDAHO.

Offices: 306–147 Milk St., Boston, Mass., and 6 First Natl. Bank Bldg., Ogden, Utah. Mine office: Nicholia, Lemhi Co., Idaho. Organized February, 1902, under laws of Utah, with capitalization $500,000, shares $1 par. R. P. Hunter, president and treasurer; Frank H. Clayton, vice-president and eastern manager; Ernest J. Waugh, secretary; O. A. Kennedy, superintendent. Lands, 8 claims, area 100 acres, in the Spring Mountain district, developed by about 1500′ of underground openings and giving ores assaying from a trace to 27.5% copper, 1 oz. to 40 oz. silver, from a trace to 57% lead and from a trace to $1.60 gold per ton.

BOSTON & LAKE SUPERIOR COPPER MINING CO. ONTARIO.

Office: 31 State St., Boston, Mass. Lands, if any, on northern shore of Lake Superior, in Canada.

BOSTON & MONTANA COPPER & SILVER MINING CO. MONTANA.

Office: 52 Broadway, New York. Mine office: Butte, Silver Bow Co., Mont. Smelter office: Great Falls, Cascade Co., Mont. Organized 1887, under laws of Montana, with capitalization $3,750,000, in 150,000 shares of $25 par value, full paid and non-assessable. Debentures; authorized and issued, $1,000,000 first issue; $500,000 second issue; $600,000 third issue. Outstanding, January 1, 1904, $400,000 at 7%. Paid dividends of $5,250,000 in 1901, $900,000 in 1902 and $1,200,000 in 1903. Dividend rate is $2 quarterly. Total dividends to January 1, 1904, $28,325,000. Practically the entire stock issue is owned by the Amalgamated Copper Co. Mines and smelter employ about 4,000 men. Sidney Chase, president; F. P. Addicks, secretary and treasurer; Sidney Chase, F. P. Addicks, Frank Klepetko, David Hennessey and James Phillips, Jr., directors; C. W. Goodale, general manager; Frank Klepetko, consulting engineer; J. C. Adams, mine superintendent; A. E. Wheeler, smelter superintendent.

The following table gives a summary of operations and results for the fiscal year ending June 1, 1903:

Tons of ore extracted	907,227
Gross yield per ton	$ 14.03
Cost of mining	2,368,982.25
Cost of mining per ton	2.16
Cost of transportation	907,227.00
Cost of transportation per ton	1.00
Cost of reduction	2,767,042.00
Cost of reduction per ton	3.05
Paid for labor	2,824,814.00
Paid for machinery and supplies	2,311,211.00
Paid for marketing, refining and selling	2,634,180.00
Recapitulation:	
Gross proceeds	$12,730,899.00
Cost of mining	2,368,983.00
Freight on ore	907,227.00
Cost of reduction	2,767,042.00
Refining and selling	2,634,180.00
Total expenditures	8,677,432.00
Net proceeds	4,053,467.00

Mineral lands are extensive, including in addition to the working mines a large number of fractional claims and part interests in various full and fractional claims. In addition to mining lands at Butte, and smelter-site at Great Falls, the company owns coal mines near Sand Coulee, 16 miles from Great Falls. The ore bodies of the Boston & Montana are the richest and the mine is the best in the Butte district. The ores are notably rich in silver and gold, returning an average of 0.025 oz. silver, valued at 1⅜ cents, with silver at 55c per oz. and ¼ cent in gold, for each pound of copper produced. The mine has been opened to a depth of 1,851′, showing excellent ore on the bottom levels, and it is altogether probable that values will hold to great depth. Frank Klepetko, formerly general manager and now consulting engineer of the property, advised in 1901 that hoists good for a depth of 3,500′ be installed. The ore mined gives average returns of 5% copper and $1.50 to $1.75 per ton, averaging about $1.62 per ton, in gold and silver values. The principal mines of the company are the Mountain View, Pennsylvania, Leonard, East Colusa, West Colusa and Moose, the latter a comparatively new property. The Mountain View has a 3-compartment shaft, 1,851′ deep, with 15 exits and connections, and on surface has a 115′ steel gallows frame and an 18x48″ Allis hoist, operating 2 double-deck cages, also an Allis air compressor with 20x42″ steam cylinders and 22x42″ air cylinders. The Pennsylvania has a 3-compartment shaft, 1,561′ deep, connected underground with the Mountain View, St. Lawrence and Silver Bow No. 1. Plant includes a 19x48″ Allis hoist, operating 2 double-deck cages, and an Ingersoll-Sergeant air compressor with 20x30″ steam cylinders and 24½x30″ air cylinders. The Leonard has a 3-compartment shaft, 1,129′ in depth, with a 19x48″ Allis hoist, operating 2 double-deck cages, and compound Nordberg compressors with steam cylinders of 15″, 28″, and 42″, and air cylinders of 19″, 27″, 29″ and 42″, also a duplex Risdon compressor with steam cylinders of 14″, 26″ and 30″ and air cylinders of 14″ and 30″.

The West Colusa has a 3-compartment shaft, 1,442′ in depth, with 7 exits and connections, timbered with 10x10″ and 12x12″ square sets, with a 60′ steel gallows-frame and a 20x60″ Nordberg hoist operating 2 single-deck cages. The East Colusa has a 3-compartment shaft, 900′ deep, with 4 exits and a 16x32″ Griffith & Wedge hoist. The Moose is a comparatively new property, with a 400′ shaft only. In addition to the hoists, there are 12x14″ Risdon sinking engines at the Mountain View, Pennsylvania, and Leonard, and a 13x12″ Iron Bay hoist at the West Colusa. About 135 power drills are operated. The ore bodies of the various Boston & Montana mines are very extensive, and reserves of smelting grade ore alone are estimated at fully 3,000,000 tons. The mine has some stopes nearly 200′ wide, carrying high-grade ore, and is opened for some years ahead of any possible productive requirements. In addition to the mines heretofore enumerated, the Minnie Healey property is claimed by the Boston & Montana, this mine being in litigation.

Steam power is used exclusively at the mine. The water from the Mountain View and East and West Colusa mines drains to the 1200′ level of the

Leonard and is forked thence by a duplex station pump with Nordberg steam-end 20″–40″–42″ with 7¼x42″ plungers. The steam-end is fitted with Corliss valve and carries a fly wheel The water-end was made by the company and cast in the Silver Bow foundry, at Butte. Valves are of the pot form and the entire water end is phosphor-bronze, and columns are lined with wood, thoroughly soaked with oil and coated on the inside with hot tar. to withstand the corrosive action of the mine water. Ultimately all of the company's mines will be unwatered from this plant, which is capable of raising 1,000 gallons per minute against a head of 1,200′. The mine water, which carries considerable copper in solution, is leached on reaching surface, the copper being precipitated on scrap-iron and product turned into bluestone.

The concentrator and smelter are at Great Falls, 171 miles from the mine, with a freight charge of $1 per ton on ore, the high freight rate being offset by the advantage of the water-power developed at Great Falls. The concentrator is second only in size to the monstrous Washoe plant of the Anaconda, and is in 6 sections, each a complete mill in itself, the six having a total capacity of 2,700 tons daily. The building is of wood and is equipped with six 10x20″ and twelve 5x12″ Blake jaw crushers, 15 Huntington mills, 18 rolls, 68 Hartz jigs, 249 Evans jigs, 5 Overstrom concentrators, 6 Wilfley concentrators 10 six-foot vanners, 54 four-foot vanners and 30 slime tables.

The smelter treats 300 to 400 tons of high grade ore and the mill-product of about 2,700 tons of concentrating ore daily. The plant has 22 McDougal calciners, five 500-ton water-jacket blast furnaces, five 175-ton reverberatory furnaces and 12 converters of the upright type, each 14′2″x7′ outside dimensions. Product is blister copper of 99% tenor, carrying 40 oz. silver and 0.25 oz. gold per ton. In connection with the smelter there is a very large electrolytic refinery having a daily capacity of 70 tons of refined copper cathodes, the gold and silver slimes being reduced and parted in a refinery at the plant. The electrolytic plant also has 3 furnaces for melting cathodes for casting the refined copper into wire-bars, cakes and ingots. The electrolytic copper from this plant is very pure and ranks high in the market. A portion of the blister copper from the smelter is sent to the Raritan copper works at Perth Amboy, N. J., and the plant also does a very limited amount of custom smelting. Current for the electrolytic plant is carried by solid overlapping slabs of copper.

Power for the concentrator, smelter and electrolytic refinery is secured from the Black Eagle Falls of the Missouri river, these having a 42′ effective head and generating 8,700 h. p., except at the lowest stages of water. The auxiliary steam plant has 2,400 h. p. in Stirling water-tube boilers and can supply power for the concentrator, blast furnace blowers, electric motors and cranes, in periods of low water.

The Boston and Montana is engaged in litigation with the subsidiary companies of the United Copper Co., and this litigation is protracted, continuous expensive, aggravated and aggravating. However, the mines of the Boston & Montana are so rich, and so extensive, that no difficulty is had in finding all the ore that the reduction plant can handle, and the cost of litigation, which would be staggering to any ordinary mine, is borne with comparative ease. Several years ago the company was re-incorporated under laws of New York, but an attempt to turn over the assets of the Montana corporation was met with local injunctions, whereupon the New York corporation was dissolved. The Boston & Montana, by reason of sundry injunctions, has been restrained for some time from paying over dividends on shares owned by the Amalgamated Copper Co., which is practically the sole owner of the Boston & Montana. Eventually this money will have to be paid over to the Amalgamated company, which is the lawful owner of the shares and clearly entitled to the dividends. Production of refined copper is not stated by the company, but for the year ending June 1, 1903, was approximately 90,750,000 lbs., produced at a net cost of 9.56c per pound, including gold and silver values, or at a cost of 11.18c. per pound, exclusive of gold and silver values, which amount to about 1⅝ cents per pound.

The Boston & Montana has been blessed with a very aggressive and capable management, since it first became a large producer. The property is in some respects the best copper mine of the world, and for 1904 will probably lead all copper producers of the globe in output.

BOSTON & NEVADA MINING CO. **NEVADA.**

Has claims near Yerington, Lyon Co., Nevada. Letter to company addressed Yerington returned unclaimed.

BOSTON & NEW MEXICO COPPER CO. **NEW MEXICO.**

Office: 502 Colonial Bldg., Boston, Mass. Organized April, 1903, under laws of South Dakota, with capitalization $200,000. Advertises asking the public to "write for prospectus," but sedulously refrained from sending same to the Copper Handbook, when requested. Has stock to sell, of course.

BOSTON & ST. MARY COPPER MINING CO. **MONTANA.**

Office: presumably Great Falls, Mont. Location of lands unknown but probably in Montana.

BOSTON-ST. PAUL CONSOLIDATED COPPER MINING CO. **WASHINGTON.**

Office: 712 St. Peter St., St. Paul, Minn. Lands all near Index, Snohomish Co., Wash. Capitalization $2,000,000, shares $1 par. Wm. H. Baker, president; O. S. Derringer, secretary. Lands, 8 claims, adjoining the Ethel. Does merely assessment work.

BOSTON & SEVEN DEVILS COPPER CO. **IDAHO.**

Letter returned unclaimed from former office, 53 State St., Boston, Mass. Mine office: Cuprum, Washington Co., Idaho. Smelter was sold for debt, in 1903, and company was in litigation and in a bad way generally at last accounts.

BOSTON-SIERRA MADRE MINE INDUSTRY CO. **COLORADO.**

Office: 1118-59 Clark St., Chicago, Ills. Mine office: Honnold, Larimer Co., Colo. Amos Pettibone, president; Lewis A. Pease, secretary, treasurer and general manager; Ralph K. Cotton, superintendent. Organized 1900, under laws of Wyoming, with capitalization $1,000,000, shares $1 par. Lands, 2 claims, area 41 acres. Has 3 fissure veins in andesite, showing copper, lead and zinc ores, assaying small percentages of copper, 20% to 30% lead, up to 60% zinc, 8 oz. to 600 oz. silver, and up to $1,400 gold per ton. Main shaft, 100′, with 7 shallow prospecting shafts and tunnels, giving about 400′ of underground openings. Has water power available.

BOSTON & SILVERTON MINING & REDUCTION CO. COLORADO.

Mine office: Silverton, San Juan Co., Colo. A. A. Lamont, superintendent. Ores carry gold, silver, lead and copper. Has steam power and a 10-stamp mill, employing about 25 men.

BOSTON TERRACE COPPER MINING CO. UTAH.

Office: care of Hon. John F. Fitzgerald, Boston, Mass. Lands are in the Newfoundland district of Utah, slightly developed and giving assays of $20 to $1,000 in copper and silver per ton.

BOSTON & TEXAS COPPER CO. TEXAS.

Office: Tremont Bldg., Boston, Mass. Lands, near Spalding, Archer Co., Texas. Organized 1898, under laws of Arizona, with capitalization $2,500,000, shares $10 par. E. M. Low, president; Jas. M. Wheaton, secretary and treasurer. Cannot be learned that any mining is being done.

BOSTON & TEXAS COPPER MINING CO. TEXAS.

Promoted, in 1898, by Chas. Denison, Hartford Trust Bldg., Hartford, Conn. Was advertised as another Calumet & Hecla. Cannot be learned that any mining has ever been attempted.

BOSTON & TINTIC MINING CO. UTAH.

Office: 401 D. F. Walker Bldg., Salt Lake City, Utah. Mine office: Silver City, Juab Co., Utah. Idle. Organized 1899, under laws of Utah, with capitalization $500,000, shares $1 par. Wm. H. Tibbals, president and general manager; E. J. Waugh, secretary; R. L. Lyman, treasurer. Lands, 3 patented claims, area 45 acres, in the Tintic district, opened by a 240′ shaft and showing 2 fissure veins of 8″ average width, 20′ length and 200′ depth, with estimated average values of 35% copper, 4% to 53% lead, 14 to 120 oz silver and 40 cents to $2 gold per ton.

BOSTON & WYOMING COPPER-GOLD CO. WYOMING.

Office: Custer, Custer Co., S. D. Mine office: Wheatland, Albany Co. Wyo. Employs 4 men. Organized October, 1903, under laws of South Dakota, with capitalization $2,000,000, shares $1 par. W. A. Nelson, president; John I. Hightower, vice-president and general manager; W. E. Benedict secretary; Lands, 6 claims, area 120 acres, known as the Seldom Seen group, showing 3 fissure veins in granite-porphyry giving assays of 5% to 7% copper, 6 oz. silver and $3 gold per ton, from cuprite, chalcocite, bornite and chalcopyrite, with sulphide ores predominating.

BOULDER COPPER MINING CO. SOUTH DAKOTA.

Office: P. O. Box 118, Custer, S. D. W. A. Nelson, president. Capitalization $1,000,000, shares $1 par. Lands, in Pennington county, South Dakota, are said to show gold and copper ores.

BOULDER MINING & MILLING CO., LTD. IDAHO.

Said to be operating in the Alto district of Idaho, on ores carrying gold, silver, lead and copper.

BRADFORD COPPER MINING CO. **ARIZONA.**

Mine office: Patagonia, Santa Cruz Co., Ariz. W. E. Balcom, superintendent.

BRADFORD DEVELOPMENT CO. **ARIZONA.**

Office: 15 Stone Ave., Tucson, Ariz. Mine office: Vail, Pima Co., Ariz Employs 20 men. F. L. Dwight, president and general manager; Stewart Bradford, secretary and treasurer; Wm. Schley, superintendent. Organized Oct. 4, 1903, under laws of Arizona, with capitalization $50,000, shares $10 par. Lands, 32 mineral claims, with total holdings of 1,000 acres, in the Helvetia and Empire districts, showing ore bodies in limestone near granite and schist contacts, carrying oxide, carbonate and sulphide ores giving assays of 17% copper 16 oz. silver and $10 gold per ton and opened by three 60′ shafts and tunnels of 80′ 100′ and 125′. Has horse power and will install machinery and establish a general store Company is composed of men of good standing, the capitalization is reasonable, the claims of the company are not excessive, and the showing of mineral values secured is very good for the work done.

NEGOCIACION MINERA DE O. y T. BRANIFF y CA. **MEXICO.**

Office: Rosales 9, Mexico, D. F. Mine office: Cadereyta, Queretaro Mex. Ores carry silver, copper, lead and zinc. Has steam power and a 6-ton smelter, employing about 200 men.

BRAULIO MADRIGAL TUMBISCATA. **MEXICO.**

Mine office: Apatzingan, Michoacan, Mexico Has steam power equipment, and is opened by shaft and tunnel.

BRINDLE PUP MINING CO. **ARIZONA.**

Said to have property near Dewey, Yavapai Co., Ariz. Letter to that address returned unclaimed.

BRISTOL MINE. **CONNECTICUT.**

At Bristol, Hartford Co., Conn. Was worked during the last decade of the Nineteenth Century. Filled with water and mine machinery at bottom of shaft at last accounts.

BRISTOL COPPER MINING CO. **NEVADA.**

Office: 201 Mining Exchange Bldg., Denver, Colo. Mine office: Pioche, Lincoln Co., Nev. Capitalization $2,000,000, shares $1 par. Wm. Gelder, general manager; H. T. Freudenthal, superintendent. Ores carry copper, silver and lead. Is closely allied with the Hillside Copper Mining Company, in ownership and management. Has made very small shipments of ore assaying 12% to 30% copper and about 10 oz. silver per ton. Property thought to be valuable, but company in financial straits at last accounts.

BRITANNIA MINES. **BRITISH COLUMBIA.**

On Howe Sound, Vancouver Island, B. C. F. M. Leonard, manager. A considerable interest is held by F. August Heinze and associates, who are said to be in control of the property, which shows a large body of low-grade auriferous and argentiferous copper ore, well located for cheap extraction, but developed by only a few hundred feet of tunnels. A 4-mile tramway is being built to the harbor, and it is planned to ship 500 tons daily to the Crofton smelter, and eventually to build a 500-ton smelter near the mines.

to organize a British corporation, early in 1904, with a capitalization of £1,000,000, to take over both this mine and the Snowshoe, paying for same in shares, on the basis of £615,000 for the British Columbia and £200,000 for the property of the Snowshoe Copper Mines, Ltd., leaving £185,000 in shares in the treasury, of which it is planned to use about £150,000 for working capital.

BRITISH COLUMBIA EXPLORATION, LTD. **BRITISH COLUMBIA.**

Mine office: Kamloops, Yale & Cariboo district, B. C. J. Argall, general manager. Property includes the Iron Mask mine and sundry claims at Kamloops, also the Colossus group at Estere Basin, Nanaimo district, where about 2,000′ of development has been secured. The Iron Mask has a 520′ main shaft, with nearly a mile of underground development. Is opened along systematic lines and recent shipments of ore to the Granby smelter have given good net assays, showing fair values in copper, silver and gold. Property has been conservatively handled and bids fair to make an excellent mine.

BRITISH COLUMBIA & LAKE SHORE COPPER CO., LTD. **BRITISH COLUMBIA.**

Letter returned unclaimed from Summit, B. C.

B. C. (ROSSLAND & SLOCAN) SYNDICATE. **BRITISH COLUMBIA.**

Is the principal shareholder of the Snowshoe mine, at Phœnix, B. C.

BRITISH SOUTH AFRICA COMPANY. **RHODESIA.**

Offices: 2, London Wall Bldgs., London, E. C., Eng. This gigantic corporation owns sundry copper fields of promise in northern Rhodesia, which, as developed to the point of actual mining, are set aside as subsidiary corporations.

BRITTON GOLD MINING CO. **WASHINGTON.**

Letter returned unclaimed from Whatcom, Wash.

K. K. BERG & HUETTENVERWALTUNG BRIXLEGG. **AUSTRIA.**

Mine office: Brixlegg, Tyrol, Austria. Is an active producer, securing considerable silver and a little gold as by-products. Gustav Kroupa, general manager; Vincens Svoboda, superintendent and mining engineer; Cayetan Hummel, smelter superintendent; Josef Link, purchasing agent. Mining lands, about 22¼ hectares. Ores are exclusively sulphide. Has a smelter at Brixlegg, this having blast, reverberatory, refining and anode furnaces and electrolytic plant. Estimated 1903 production of the company, 225 metric tons of copper, 600 kilograms silver and 5 kilograms gold.

BROKEN HILL PROPRIETARY CO., LTD. **AUSTRALIA.**

Offices: 320, Collins St., Melbourne, Victoria, Australia, and 3, Great Winchester St., London, E. C., Eng. Mine office: Broken Hill, N. S. W. Australia. D. W. H. Patterson, chairman Australian board; F. Dutton, chairman London board; G. D. Delprat, general manager; A. J. Harwood, mine manager; F. M. Dickenson, secretary in Melbourne; R. J. Seeley, secretary in London; L. A. Williams, agent, Alfred Chambers, Adelaide, Australia; R. N. Kirk, agent, Sydney, N. S. W. Capital, nominal, £384,000, shares 8s. par. Has been a very large dividend payer since 1891. Property is the Broken Hill silver-lead mine, sundry leases of iron ore lands for fluxes and lands at Port Pirie. Has steam and electric power, 2,000 ton concentrator and extensive leaching works at Port Pirie, employing about 2,500 men. Formerly produced copper matte carrying about 300 tons of refined copper yearly, but secretary states that under new metallurgical methods the copper is lost in saving the silver.

BROMIDE COPPER CO. **NEW MEXICO.**

Supposed to have mineral lands near Tres Piedras, Taos Co., N. M.

BROMIDE COPPER & GOLD MINING CO. **NEW MEXICO.**

Has 22 claims in the Bromide district, Rio Arriba, Co., N. M. Did considerable development work in 1902.

BRONZE MONARCH GROUP. **WASHINGTON.**

Has a 300′ tunnel, on claims adjoining the Sweden group, near Mount St. Helens, Skaminia county, Washington. Has produced about 1,000 tons of sulphide ore carrying gold, silver and copper.

BROOKLYN COPPER & GOLD MINING CO. **WASHINGTON.**

Office: Auditorium Bldg., Spokane, Wash. Capitalization $100,000. M. L. Pershell, president; C. von Gilsa, secretary. Lands are in the Colville Reserve, Washington. Declines to furnish statement.

BROOKLYN MINING CO. **CALIFORNIA.**

Mine office: Dale, San Bernardino Co., Cal. H. H. Ames, superintendent. Ores carry gold and copper. Has gasoline power and 3-stamp mill.

BROOKLYN MINING CO. **COLORADO.**

Mine office: Silverton, San Juan Co., Colo. T. Manion, superintendent. Ores carry gold, silver and copper. Has steam power and a 10-stamp mill.

BROOKLYN MINING CO. **NEVADA.**

Mine office: Contact, Elko Co., Nev. Has gasoline power.

BROPHY, HUMPHREY & CO. **MEXICO.**

Said to operate the San Fernando copper mine, near Ensenada, Baja California, Mexico, but letter to that address returned unclaimed.

BROWN-ALASKA COPPER CO. **ALASKA.**

Mine office: Coppermount, Prince of Wales Island, Alaska. Samuel Silverman, general manager; Paul Johnson, consulting engineer. Property includes the Mamie group and adjoining claims. Ore body on the Mamie is about 40′ wide, giving average assays of 6% copper and $1 gold and silver per ton. Ore is chiefly chalcopyrite, associated with pyrrhotite and pyrite. Considerable mining development has been secured, and efforts are now being concentrated on the completion of the smelting plant, which is large and excellently planned. The reduction plant includes a 60x80′ sampler, 50′ high; coke and coal sheds 100x140′; blast furnace building 60x70′, of steel construction, with room for addition of converter plant; 40x50′ boiler house; 45x50′ engine house and 4 sets of ore bins, 60x120′, with capacity of 10,000 tons. The plant is so arranged that material will be handled automatically. The furnace is 44x160″ at the tuyeres, with daily capacity of 400 tons, equipped with mechanical feeders. Slag will be handled by 2 locomotives, drawing 5-ton slag-cars. Coke will be brought from Ladysmith, B. C., at a cost of about $6 per ton, delivered. Plant includes a 250-light electrical equipment. It is planned to blow in the smelter at an early date, and it is hoped to double or treble the present capacity within a short time. Contracts have also been made with the Cracker Jack mine to furnish auriferous quartz for linings, and with the Mt. Andrews mine for a daily supply of 100 tons of copper ore. This is one of the most promising copper properties in Alaska, and while it has not been so much in evidence in the newspapers as some, its management has secured very extensive development, and will shortly begin the actual production of copper.

BRUCE COPPER MINES, LTD. **ONTARIO.**

In voluntary liquidation. L. Abrahams, et al., liquidators, 31, Palmerston Bldgs., London, E. C., Eng. Property is the old Bruce Mines, on Georgian Bay, Algoma, Ont., opened in 1846, closed 1876, after producing $3,300,000 worth of copper. Lands include mineral rights to 20 square miles. Depth, nearly 500′; ores, sulphide, mainly chalcopyrite in quartz gangue, occurring in several parallel veins traversing diabase and running nearly east and west. The two principal veins are 3′ and 15′ wide, giving ore said to average 5% copper. Plant includes rock crushers, rolls, jigs, hydraulic sizers, round tables, Griffin mill and Frue vanners. Concentrator said to have daily capacity of 400 tons. Property thought to be valuable, but cannot be worked to advantage without a smelter on the ground, or more easily accessible than is now the case.

BRUCE & CHESSOR MINING CO. **BOLIVIA.**

Mine office: Oruro, Bolivia. Has steam power and works 100 men.

BRUGER Y CA. **BOLIVIA.**

Office and mine: Toledo, La Paz, Bolivia. Are small producers of copper and have steam power.

JOSE GONZALEZ BRUNO. **CHILE.**

Mine office: Cojon de Maipu, Santiago, Chile. Has copper ores, carrying cobalt in connection, with steam power and works about 50 men.

BRUNSWICK MINING CO. **COLORADO.**

Mine office: Tin Cup, Gunnison Co., Colo. Ores carry gold, silver and copper. Has steam power and a 100-ton concentrator.

BUCHANAN MINE. **CALIFORNIA.**

Near the northern boundary of Madera county, California, a little south of the Green Mountain mine in Mariposa county, and 5 miles northeast of Daulton. Owned by G. A. Pherson. Opened by shafts and tunnels. Vein matter, diabase and amphibolite schist, both mineralized. Ores, oxides near surface, unaltered sulphides at depth. Shipments made by lessees average about 15% copper and $3 gold per ton. Has been a considerable producer in the past.

BUCKEY GROUP. **ARIZONA.**

Office: care of A. Chas. Smith, P. O. Box 312, Douglas, Ariz.

BUCKEYE CONSOLIDATED GOLD & COPPER MINING CO. **NEW MEXICO.**

Former office: 414 Atlas Blk., Salt Lake City, Utah. Had property near Socorro, Socorro Co., N. M. Dead.

BUENA VISTA COPPER MINES, LTD. **MEXICO.**

Offices: 11, Queen Victoria St., London, E. C., Eng. S. Spencer, chairman; E. T. Stanton, secretary. Capital, nominal, £50,000 Lands, 45 acres, including the Buena Vista and San Bruno copper mines, near the Boleo mine, in Lower California, Mexico.

BUENA VISTA COPPER MINING CO. **ARIZONA.**

Mine office: Solomonville, Graham Co., Ariz. Has a 100′ shaft, showing well in ore, and sent a sample shipment of 25% ore to the El Paso smelters in November, 1903.

BUENA VISTA COPPER MINING CO. **CALIFORNIA.**

Mine office: Valley Springs, Amador Co., Cal. Property includes the Bull Run and Russell mines, carrying sulphide copper ores in schistose diabase. Has steam power.

BUENA VISTA MINING & MILLING CO. **ARIZONA.**

Mine office: Washington, Santa Cruz Co., Ariz. F. Cox manager, at last accounts. Ore carries gold, silver and copper.

BUENOS AIRES MINING CO. **MEXICO.**

Mine office: Cusihuirachic, Chihuahua, Mexico. W. C. Rollins, superintendent. Lands include La Lola and El Murillo mines, carrying ores of gold, silver and copper. Has gasoline power, concentrator and a 40-ton smelter, employing about 40 men.

MINAS BUENOS AMIGOS Y OTRAS. **MEXICO.**

Office: care of H. C. Harrison, owner, Apartado Postale, 64, Monterey, N. L., Mex. Mine office: Cerralvo, N. L., Mex. Are producers of silver, lead and copper, latter as a by-product, and employ about 100 men.

BUFA MINING, MILLING & SMELTING CO. **MEXICO.**

Mine office: 709 Lankershim Bldg., Los Angeles, Cal. Mine office: La Bufa, Sahuaripa, Sonora, Mex. Employs about 300 men in the dry season and 150 in the wet season. Organized 1902, under laws of Arizona, with capitalization $1,500,000, shares $1 par. Davis Richardson, president; Wm. E. Richardson, vice-president; Baron W. Riley, secretary; L. R. Richardson, treasurer; Frank Richardson, superintendent; Arthur A. Lane, mill superintendent; P. Quinn, mine superintendent; Edwin M. Clark, engineer and metallurgist. Lands, 35 pertenencias, area 86 acres, also a 3-acre millsite and 5,000 acres of miscellaneous lands, showing 6 fissure veins, of which 2 are undergoing development, these averaging 4′ width and opened to 600′ on an incline, giving average assays of 12% copper, 10% lead and 325 oz. silver per ton, from argentiferous tetrahedrite and sulphide copper ores. Has 3 shafts, deepest 470′, with 6,500′ of underground openings and about 15,000 tons of high-grade ore blocked out for stoping. Has a complete steam power equipment, 20-ton concentrator and leaching plant, 5-stamp mill and 2 roasting furnaces, and is completing a new concentrator and smelting plant. Nearest railway is 160 miles distant, and smelter will effect a very great saving in transportation charges. Began payment of 2.5% semi-annual dividends in January, 1903.

BUFFALO GROUP. MONTANA.

Claims in the Scratch Gravel district, northern Montana. Taken under bond by Lake Superior mining men in 1902, but dropped later for Arizona claims.

COMPANIA DEL FERROCARIL Y MINAS DEL BUITRON. SPAIN.

Mine office: Zalamea la Real, Huelva, Spain. Don Diego Bull, general manager. Company is controlled by F. C. Hills & Co., of London. Mines include the Castillo del Buitron and La Poderosa, area 6 hectareas, at Zalamea, and the Concepcion mine, area 42 hectareas, at Almonaster. Sundry other properties are under exploration. Annual production is estimated at about 1,500,000 lbs. of refined copper.

MINA CASTILLO DE BUITRON. SPAIN.

See Compania del Ferrocaril y Minas del Buitron.

BULL DOMINGO MINING CO. WYOMING.

Mine office: Hecla, Laramie Co., Wyo. John L. Morgan, superintendent, at last accounts. Ore carries copper and gold values.

BULLARD MINE. ARIZONA.

Five claims in Cunningham Pass, Yuma Co., Arizona, said to give assays of 12% copper and $12 gold per ton.

BULLION MINING CO., LTD. IDAHO.

Office: Wallace, Idaho. Employs 8 men. Organized 1902, under laws of Idaho, with capitalization $1,000,000, shares $1 par. B. F. O'Neil, president; James H. Taylor, secretary; D. A. McKenzie, general manager. Lands, 4 claims, area 80 acres, showing a 12′ fissure vein giving assays of 14% copper, $4 gold and 12 oz. silver per ton, from sulphide ore. Shaft, 100′; tunnels, 80′ and 170′.

BULLION BECK & CHAMPION MINING CO. UTAH.

Mine office: Eureka, Juab Co., Utah. P. L. Farnsworth, manager. Secures a limited amount of copper as a by-product from gold-silver-lead-copper ores. Has steam and electric power and concentrator, employing about 150 men.

BULLWHACKER GOLD & COPPER CO. ARIZONA.

Promoted by H. B. Clifford & Co., 10 Wall St., New York. Lands 4 miles east of Prescott, Yavapai county, Arizona.

BULLY HILL COPPER MINING & SMELTING CO. CALIFORNIA.

Office: Salt Lake City, Utah. Mine office: Delamar, Shasta Co., Cal. Employs about 300 men. Organized under laws of New Jersey, with capitalization $2,500,000, shares $25 par. J. R. De La Mar, president; H. P. Parsons, treasurer; John B. Keating, superintendent. Was under option to the Mt. Shasta Gold Mines Corporation, but was not absorbed by that company in October, 1902, as claimed. Lands, 18 patented claims, area 213 acres, in the Pittsburg district, 25 miles northeast of the Mountain Copper mine at Keswick, and in the same geological horizon. Also owns the Idaho, Iowa and Columbia claims, bought September 1903, and has under bond the Copper City mine, opened by a 160′ shaft showing high-grade ore. The Bully Hill was opened as a gold mine and worked the gossan with rather indifferent results until copper ores were developed at depth. Bully Hill, rising 1,200′ above the surrounding country, with a diameter of about 4,000′, is composed of eruptive rocks, principally rhyolite, with 3 mineral zones having a strike of approximately north and south, the ore occurring in shear-zones in rhyolite and meta-diabase dykes, all of superficially slaty structure, the lenses having a clay gouge of 1′ to 30′ on one or both walls. The main lenses have stringers and feeders ranging from a few inches to 30′ in width, and carrying 2% to 30% copper. The principal lenses are 20′ to 300′ long, 2′ to 40′ wide and one has been opened to a depth of 700′. The zone of secondary enrichment shows about 10′ of bonanza ore, the main ore bodies below carrying chalcopyrite associated with pyrite, also a little bornite and chalcocite, with occasional carbonate and oxide ores and native copper. The best ore body gives average assays of about 15% copper, 6 oz. silver, and $8 gold per ton, and shows native copper and native silver in considerable quantities on the 670′ level. Principal development is by 3 tunnels, giving a back of 350′. No. 2 tunnel has double tracks, and an underground station 100′ square in No. 3 shaft contains powerful hoisting and pumping machinery. The mine is timbered with square sets and operated by steam, water and electric power. The smelter, costing about $200,000, is 39x310′ in size, with a 90′ stack, and having a daily capacity of 300 tons. The reduction plant is terraced, handling all material by gravity, and has roast-stalls in series, with 2 McDougal calcining furnaces and two 42x120″ blast furnaces, making matte of 35% to 50% tenor, which is taken in ladles by a 20-ton electric traveling crane to the conversion department, which has 2 stands of converters with 68x98″ five-ton shells, turning out blister copper of 98% tenor, which is shipped to the DeLamar refinery at Carteret, N. J., for electrolytic treatment. The smelter has a good machine shop, and a small concentrator has been added for experimental work on the low-grade ores, of which the property has enormous bodies. Limestone and iron ore for fluxes are obtained on the McLeod river, six miles from the mine. This is the second largest copper property of California, and is said to have been highly profitable, though all details as to as to finances are withheld.

BUNKER HILL MINING & SMELTING CO. **WASHINGTON.**

Office: 714–1123 Broadway, New York. Mine office: Index, Snohomish Co., Wash. Chas. G. Reiter, president; John D. Campbell, secretary; Wilbur Morris, general manager; V. V. Clark, superintendent and engineer. Organized Oct. 24, 1902, under laws of Maine, with capitalization $3,000,000, shares $1 par; unissued $569,959. Lands, 18 claims, showing sundry fissures in granite and contacts between granite and diorite, with two ore bodies undergoing development, one showing an ore chute 2′ to 50′ in width and about 300′ in length on the lowest level, this carrying sulphide ores averaging about $8 per ton in value. Has a hoist and one half of an Ingersoll–Sergeant single-stage 12-drill air compressor, and has recently replaced steam with water power. Has necessary mine buildings and is served by the Great Northern railway, which passes the mine. Company plans continuing development and installing a concentrator in 1904. Property is handled conservatively and is regarded as promising.

BUNKER HILL-SULLIVAN COPPER MINING CO. **WASHINGTON.**

Office; 1123 Broadway, New York. Mine office: Index, Snohomish Co., Wash. Chas. G. Reiter, president; John D. Campbell, secretary; Chas A. Eckerson, superintendent. Lands, 9 claims, showing 2 veins carrying argentiferous chalcopyrite said to average 8% copper. Has steam power and about 1,500′ of underground openings.

BUNKERVILLE MINING CO. **NEVADA.**

Mine office: Bunkerville, Lincoln Co., Nev. L. C. Bradley, superintendent, at last accounts.

BURLINGTON COPPER MINING CO. **WYOMING.**

Supposed to have property in the Encampment district of Carbon county, Wyoming. No returns secured.

BURMAH COPPER MINES, LTD.

A cheap bid for notoriety. The Burmah Agency, Ltd., was registered, without articles of association, Nov. 5, 1903, in London, with a nominal capital of £100, and at the same time this flatulent concern registered 16 subsidiary corporations, each with the same magnificent capital of £100, and each beginning its title with the word Burmah, the "Burmah Copper Mines, Limited," (exceedingly) being one of the sweet sixteen.

BURMAH GOLD MINING CO. **COLORADO.**

Mine office: Wortman, Colo. Geo. C. Wortman, manager. Ores carry gold, silver, lead, copper and zinc. Has steam power and a 30-ton concentrator.

BURNS MINING CO. **WASHINGTON.**

Mine office: Darrington, Snohomish Co., Wash. Thos. Parks, superintendent. Was driving a tunnel on the Justice and Myrtle claims, with a small force, at last accounts.

BURNS-MOORE MINING & TUNNEL CO. **COLORADO.**

Mine office: Idaho Springs, Clear Creek Co., Colo. John M. Shaller, superintendent. Ores carry gold, silver, lead and copper. Has water power and employs a small force.

BURRA BURRA COPPER MINING CO. **AUSTRALIA.**

Office: Weymouth St., Adelaide, So. Australia. Mine office: Kooringa, So. Australia. Wm. West, superintendent. Mine is about 100 miles northeast of Adelaide and was opened 1845; reopened, circa 1900, by present owners. Mine has paid dividends of £800,000, and was a large producer for many years, having made 51,662 long tons of refined copper previous to 1877. Ores in upper levels were cuprite, malachite, azurite and native copper, occurring in very rich but irregular bunches. Lower levels show bornite and chalcopyrite. Has steam and electric power and employs about 50 men.

BURRAGA COPPER CO. **AUSTRALIA.**

In the Bathurst district, Central division of New South Wales, one mile east of the "Lloyd" mine. Opened 1877; production, 570 long tons, in 1898. Ores, sulphide, occurring in a belt of highly altered rocks, ranging from porphyry to schistose slates. Ores carry 1 to 3 oz. silver per ton. Mine is about 800′ deep; smelter has 3 reverberatory furnaces, using wood for fuel; product is sent as 47% matte to Lithgow, for refining.

BURTON CONSOLIDATED COPPER CO. **WYOMING.**

Office: Encampment, Carbon Co., Wyo. Claims, in vicinity. R. R. Burton, superintendent.

BUSTER MINES SYNDICATE, LTD. **ARIZONA.**

Offices: Broad Street House, London, E. C., Eng. J. A. Edmond, chairman; J. R. Shearer, secretary. Capital, £15,000; debentures, £1,600, at 10%. Property is a three-fifths interest in a copper mine said to be located in the Peak mining district of Arizona.

BUTLER MINING & MILLING CO. **UTAH.**

Absorbed by Butler-Liberal Consolidated Mining Co.

BUTLER-LIBERAL CONSOLIDATED MINING CO. **UTAH.**

Mine office: Bingham Canyon, Salt Lake Co., Utah. Organized 1903, with capitalization $500,000, shares $1 par. Is a consolidation of the Ben Butler and Bingham Mining companies. A. L. Jacobs, general manager; D. R. Williams, superintendent. Product is mainly lead, with small silver and copper values. Declared a dividend of one-half cent per share, amounting to $2,500, in October, 1903.

BUTTE CONSOLIDATED MINING CO. **MONTANA.**

Mine office: Butte, Silver Bow Co., Mont. E. H. Renisch, superintendent. Property is the Ella mine, having a 700′ two-compartment shaft, showing auriferous copper ore.

BUTTE COPPER CO. **MONTANA.**

Supposed to be composed of eastern men and to hold bonds on the Amazon, Jessie and other claims in the eastern part of Butte, Silver Bow county, Montana. Unknown in Butte.

BUTTE COPPER MINING & SMELTING CO. **MONTANA.**

Office: care of Patrick Mullins, Butte, Mont. Organized in last week of December, 1903, under laws of Montana, with capitalization $600,000, shares $1 par, presumably to take over sundry valuable mining claims in the Butte camp owned by Mayor Patrick Mullins.

BUTTE GOLD, SILVER & COPPER CO. **WASHINGTON.**

Office: Spokane, Wash. Lands, about 25 miles from head of Lake Chelan, showing 2 veins, one 8′ wide, opened by tunnels.

BUTTE MINE & EXPLORATION CO. **MONTANA.**

Said to have bought the Pacific mine, in East Butte, Montana, for $40,000, in 1902. Letter to company returned unclaimed.

BUTTE MINING & DEVELOPMENT CO. **MONTANA.**

Office and mine: Butte, Silver Bow Co., Mont. Organized under laws of New Jersey, with capitalization $2,000,000, shares $5 par. Lee Mantle, president; W. W. McDowell, secretary. Spent about $185,000 in sinking an 800′ shaft on the Emma mine, in East Butte. Vein at bottom of shaft is about 300′ wide and carries about 2% copper only. Machinery was sold to pay floating indebtedness, and company apparently is moribund.

BUTTE REDUCTION CO. **MONTANA.**

Office and works: Butte, Silver Bow Co., Mont. Owned by Senator W. A. Clark and treats the ores of the Original and Stewart mines. Smelter was practically rebuilt in 1903, and given new reverberatory furnaces planned to convert matte into blister copper without subjection to the Manhes or ordinary bessemerizing process of conversion.

BUTTE & ARIZONA COPPER CO.

Letter returned unclaimed from Butte, Silver Bow Co., Mont.

BUTTE & BINGHAM COPPER CO. **UTAH.**

Mine office: Bingham Canyon, Salt Lake Co., Utah. O. Roberts, superintendent, at last accounts. Cannot be learned that property is working.

BUTTE & BOSTON CONSOLIDATED MINING CO. **MONTANA.**

Office: 52 Broadway, New York. Mine office: Butte, Silver Bow Co., Mont. Organized under laws of New York, with capitalization $2,000,000, shares $10 par. Debentures, $1,500,000 first mortgage 6% bonds, due April, 1917. Practically the entire stock issue is owned by the Amalgamated Copper Co. Annual meeting, first Monday in April. James Phillips, Jr., president; Wm. G. Rockefeller, secretary and treasurer; John Gillies, superintendent. Lands, sundry mines and undeveloped claims in Butte, including the Silver Bow, Michael Davitt, Blue Jay, East and West Grey Rock and Berkeley mines, also several thousand acres of placer land, and claims the Tramway and Snohomish mines, which are in litigation and operated by a receiver. Silver Bow shaft No. 1 is 1,000′ deep, with 3 compartments and a 16x42″ hoist, with an 800-gallon Riedler pump on the bottom level. Silver Bow No. 3 has a 700′ 4-compartment main shaft, with a 500-gallon Knowles pump on the 600′ level. The East Grey Rock has a 1,600′ 3-compartment shaft, with 20x48″ hoist and 28-drill Nordberg air compressor. The Berkeley has a 900′ 3-compartment shaft, with 18x32″ hoist. The Blue Jay has a 2-compartment shaft 1,075′ deep, sunk at an angle of 72°, with 3 compartments below the 600′ level, and a 16x32″ hoist. Ores are lower in copper and richer in silver than the average of the district, the blister copper carrying about 100 oz. silver per ton. The smelter has 700 tons daily capacity and does more or less custom work, the concentrator and smelter being at Meaderville, just east of Butte. The company employs 600 to 700 men when working a normal force.

The following table gives comparative figures for the past three fiscal years ending June 1:

	1903	1902	1901
Tons of ore extracted	245,333	189,499	214,310
Cost of mining	$801,400	$767,754	$969,047
Cost of transportation	39,287	36,523	41,019
Total cost of reduction	524,361	404,723	551,344
Paid for labor	785,705	709,689	888,860
Machinery and supplies	540,056	462,787	631,531
Refining and marketing	281,935	199,961	....
Net earnings	202,408	165,617	586,053

BUTTE & IOWA MINING CO. **MONTANA.**

Mine office: Butte, Silver Bow Co., Mont. John Hewett, superintendent. Property includes the Colorado mine. Has steam power.

BUTTERNUT GOLD & COPPER MINING CO. **ARIZONA.**

Mine office: Val Verde, Yavapai Co., Ariz. Cecil G. Fennell, general manager; S. E. Bretherton, superintendent. Has auriferous and argentiferous copper ores, with gasoline power.

BUTTON GOLD MINING CO. **ARIZONA.**

Mine office: Minnehaha, Yavapai Co., Ariz. Wm. Button, superintendent. Ores carry gold, silver and copper. Has steam power and 5-stamp mill employing about 20 men.

EL CABALLO MINE. **MEXICO.**

Mine office: Inde, Durango, Mexico. Wm. Benton, owner; J. M. De La Torre, superintendent. Has steam power and produces silver and copper, with a force of about 50 men. Said to be under option to Guggenheim Exploration Co.

CABALLONA MINE. **MEXICO.**

Said to be in the Arizpe district of Sonora, Mexico, about 15 miles south of Douglas, Arizona. Was a shipper of copper ore carrying gold and silver values, to the smelters at El Paso, during 1903.

CABEZAS DEL PASTO MINES. **SPAIN.**

Mine office. Puebla de Guzman, Huelva, Spain. Owned by C. & J. Sundheim, who have operated the property since 1887. Wm. Guthrie Bowie, general manager; Don Jorge Riecken, superintendent. Lands, 6 government concessions, area 104 hectares, with about 300 hectares of adjoining lands, having 12 shafts, deepest 104 metres, with 5,000 to 6,000 metres of underground openings. Ore developed for immediate mining is estimated at 750,000 tons of pyritic ore, and 1,500,000 tons of cupriferous schists. Lenses apparently increase in size at depth. Mine is opened by overhand stoping and dry-walling is used in depleted stopes. Ores carry 1.5% to 5% copper, 40% to 52% sulphur and 40% to 44% iron. The schists range 0.25% to 30% copper. All pyritic ore above 1.5% copper, and all schists above 10% copper, are exported. The lower grade ores are weathered at the mine, to produce cement copper, and the washed ore, free of copper, is sent to France for the sulphur contained. The water from the mines, where 80,000 to 100,000 cubic metres are in constant storage, carries up to 9 kilograms of copper in solution to each cubic metre, most of which is saved by cementation. The cement copper is washed and classified, the best quality averaging 98.5% copper, which is much the best grade of cement copper produced anywhere. Mining by overhand stoping and rock filling is said to prove safer and cheaper than open-cast operations. Surface plant includes Robey hoisting and pumping engines, and the mine has a tramline of 76 cm. gauge, also an aerial tram to the wharves at La Laja, on the river Guadiana.

CABRALES COPPER SYNDICATE, LTD. **SPAIN.**

Offices: 18, Walbrook, London, E. C., Eng. R. W. Outram, secretary. Capital, nominal, £12,000; issued, £1,207. Lands, if any, in Spain.

CABRERA MINING CO. **MEXICO.**

Mine office: Velardeña, Durango, Mexico. M. Levy, superintendent, at last accounts. Ores carry copper, silver and lead.

MINAS Y FUNDICION DE CACOMA. **MEXICO.**

Office and works: Autlan, Jalisco, Mex. Wm. A. Cassils, agent; John Mann, mine superintendent; M. E. Raines, smelter superintendent. Lands, 5 hours' horseback ride northwest of Autlan, including the Volcancillos, Purisima and Palestina mines, carrying auriferous and argentiferous copper ores, opened by a 165' shaft and a 160' tunnel. Has steam power and a 10-ton smelter, employing 50 to 75 men.

CACOMA MINES & SMELTER CO. **MEXICO.**

See Minas y Fundicion de Cacoma.

CACTUS GROUP. **UTAH.**

See Newhouse Mining & Smelting Co.

CACTUS SMELTING & COPPER CO. **UTAH.**

Absorbed by Royal Copper Mining Co., now Newhouse Mining & Smelting Co.

SOCIEDAD MINAS DE CALA. **SPAIN.**

Offices: Bilbao, Vizcaya, Spain. Mine office: De Cala, Santa Olalla, Huelva, Spain. Property is a group of 8 mines, area 346 hectares; product is iron-copper pyrites and magnetic iron ore. In course of development.

CALABASAS COPPER CO., LTD. **ARIZONA.**

Office: 66 Broadway, New York. Mine office: Tucson, Pima Co., Ariz. Organized 1901, under laws of Arizona, with capitalization $5,000,000, shares $1 par. Fredk. W. Pope, president; James D. Taitt, secretary; H. H. Douglass, treasurer. A Douglas-Lacey promotion. Annual meeting, third Tuesday in January. Lands, 380 acres, in the Tyndall district of Santa Cruz Co., Ariz. The company claims to have an ore body 8' wide and one mile long and with 100,000 tons of 28% ore in sight, which is either a ridiculous mistake or a wilful misrepresentation. Has a 50-ton water jacket smelter. Company claimed on Dec. 20, 1901, that the probable production of refined copper for 1902 would be about 600,000 pounds. So far as can be learned no production whatever has been secured. Apparently another Douglas-Lacey "mistake."

CALAVERAS MINING ASSOCIATION. **NEW MEXICO.**

Mine office: Alamagordo, N. M. E. A. Hersperder, superintendent. Lands include the Black Burro mine, showing sulphide ores of copper and lead.

CALCANTE COPPER & NICKEL MINES. **ITALY.**

An idle property near Traves, Torino, Italy, in the western Alps of Piedmont. Once a large producer of nickel, cobalt and copper, latter from chalcopyrite, found in stratified archaic rocks.

CALEDONIA COPPER CO. **MICHIGAN.**

A proposed organization to take over the Flint Steel and adjoining mines, in Ontonagon county, Michigan. Company not formed.

CALEDONIAN COPPER CO., LTD. **NEW CALEDONIA.**

Offices: 79½, Gracechurch St., London, E. C., Eng. Mine office: Nouméa, Diahot district, New Caledonia. Geo. Allan, president; James W. Chenhall, consulting engineer; A. J. Lindsay-Simpson, secretary. Lands are about 4,000 acres, including the Ao and Pilou mines. Direct title is held by Les Mines de Cuivre Pilou, Ltd., entire stock issued of which is owned by Caledonian Copper Co., Ltd. Capital, £750,000, shares £5 par. Debentures, £100,000 authorized; £46,000 issued at 7.5%. The Pilou mine has been extensively developed and is connected by tunnel with the Ao, 2.5 miles distant. Main shaft, 240 metres. Ores are carbonates and oxides near surface, succeeded at slight depth by argentiferous chalcopyrite and galena. Ore is dressed to tenor of 13% to 15% copper, the concentrated ore carrying 200 to 400 grams of sliver per ton from the sulphide ores and 2 to 4 grams gold per ton from the oxidized surface ores. Plant includes a 200-ton concentrator, which is to be doubled in capacity, and a smelter. No returns of production have been made public.

CALEDONIAN EXPLORATION CO. **MEXICO.**

Mine office: San Nicolas del Oro, Guerrero, Mex. T. B. C. Murphy, superintendent. Property is the Nantzintla mine, carrying ores of gold, silver and copper. Is developing by tunnel, with force of about 12 men.

CALEDONIAN MINING CORPORATION, LTD. **NEW CALEDONIA.**

E. Wells, receiver and manager, 66, Coleman St., London, E. C., Eng. Property comprises sundry lands carrying copper, silver and lead in New Caledonia.

COMPANIA MINA DE CALIFORNIA. **MEXICO.**

Letter returned unclaimed from Cumuripa, Sonora, Mexico. Organized 1901, with capitalization $1,000,000. Said to claim 20 pertenencias of mining lands.

CALIFORNIA COPPER CO. **CALIFORNIA.**

Office: 31 Nassau St., New York. Property is the Ne Plus Ultra and adjoining claims, near Daulton, Madera Co., Cal. Has a 100-ton smelter, but ores proved refractory and unsuited to economical extraction.

CALIFORNIA GOLD & COPPER CO. **CALIFORNIA.**

Mine office: Spenceville, Nevada Co., Cal. C. C. Bitner, president and general manager. Has auriferous and argentiferous copper ores, with water and electric power, and employed about 20 men at last accounts.

CALIFORNIA IMPROVEMENT CO. **CALIFORNIA.**

Office: care of F. M. Smith, president, Oakland, Cal. Owns the Leona Heights mine, in Alameda Co., Cal., showing a 12′ body of cupriferous iron pyrites rich in sulphur and well adapted to the manufacture of acid, with recovery of copper as a by-product. Has a prominent gossan capping.

CALIFORNIA MINING CO. **COLORADO.**

Office: 2 Toltec Bldg., Denver, Colo. Letter returned unclaimed from Rollinsville, Gilpin Co., Colo. Emerson J. Short, president and general manager. Has a 100′ shaft showing a 2′ paystreak of argentiferous and auriferous chalcocite assaying 25% to 40% copper.

CALIFORNIA MINING CO. **UTAH.**

Mine office. Park City, Summit Co., Utah. S. Levy, superintendent.

Ores carry gold, silver, lead, copper and zinc. Has steam power and a 50-ton concentrator, employing about 50 men.

CALIFORNIA-AMECA MINING CO. **MEXICO.**

Mine office: Ameca, Jalisco, Mex. G. W. Whitney, manager. Is developing the San Pedro copper mine, with a force of about 20 men.

CALIFORNIA & ARIZONA COPPER MINING CO. **ARIZONA.**

Office: care of Pacific States Mining & Investment Co., 326 Post St., San Francisco, Cal. Lands, 7 claims in the Huachuca Mountains, Cochise Co., Ariz., 17 miles west of Bisbee. Cannot be learned that any work is in progress.

CALIFORNIA COPPER KING CO. **CALIFORNIA.**

Letter returned unclaimed from former office, 218 So. Broadway, Los Angeles, Cal. S. P. Creasinger, president; H. R. Adams, first vice-president and manager; Stanley Harris, secretary and treasurer. Lands, 21 claims, in two groups, on Pahlen and McCoy mountains, Riverside county, California. Opened by shafts showing various ore bodies, 4′ to 40′ wide.

CALUMET & SAULT STE MARIE DEVELOPMENT CO. **ONTARIO.**

Office: Calumet, Mich. Fred Roehm, president; Wm. F. Ashton, superintendent. Lands are in the vicinity of the Copper Queen, in Algoma, Ontario, and are opened by a 90′ shaft showing a 14′ vein carrying auriferous chalcopyrite.

CALUMET & YAQUI RIVER COPPER CO. **MEXICO.**

Office: La Cananea, Sonora, Tex. Organized May, 1903, under laws of Arizona, with capitalization $3,000,000, shares $10 par.

CALIFORNIAN COPPER SYNDICATE, LTD. **CALIFORNIA.**

Offices: 188, St. Vincent St., Glasgow, Scotland. Capital, nominal, £30,000; issued, £28,322. Lands, sundry claims in Fresno Co., Cal.

MINA DA CALINNHA. **PORTUGAL.**

Office: care of M. Paul Chapuy, manager, Santa Appolonia, Lisbon, Portugal. Understood to be owned by a French company. Exports cupriferous iron pyrites to England in limited quantities.

CALLETANO MINING & SMELTING CO. **ARIZONA.**

Mine office: Calabasas, Pima Co., Ariz. C. O'Brien Reddin, general manager. Lands, 2 groups, showing 12 veins, from which selected samples have given assays of 9% copper, $2.50 gold and 400 oz. silver per ton.

CALSTOCK TIN & COPPER, LTD. **ENGLAND.**

Offices: 16, Place Vendome, Paris, France. Mine office: Calstock, Cornwall, England. J. Errington de la Croix, chairman; C. Fred Thomas, mine manager; John A. Russell, secretary. Property is the Prince of Wales mine, product of which is mainly tin, with a little copper secured as a by-product. While an English corporation, stock is mainly owned in France, and operations of the company have excited great interest, because of the fact that foreign capital is now developing a Cornish mine for the first time.

CALUMET COPPER CO. **COLORADO.**

Mine office: Turret, Chaffee Co., Colo. Elmer E. Briggs, superintendent.

Property is the Copper King mine, carrying auriferous and argentiferous copper ores, now undergoing development with force of about 10 men.

CALUMET COPPER MINING CO. **WASHINGTON.**

Dead. Property sold under foreclosure.

CALUMET MINING & MILLING CO. **WYOMING.**

Mine office: Encampment, Carbon Co., Wyo. S. E. Phelps, secretary.

CALUMET & ALGOMA DEVELOPMENT CO. **ONTARIO.**

Office: care of Peter Primeau, secretary, Marquette, Mich. Capitalization $5,000, fully paid. Property is the Herminia mine, in Algoma, Ontario.

CALUMET & ARIZONA MINING CO. **ARIZONA.**

Office, Calumet, Mich. Mine office: Bisbee, Cochise Co., Ariz. Smelter office: Douglas, Cochise Co., Ariz. Employs 500 men. Organized March, 1901, under laws of Arizona, with capitalization $2,500,000, shares $10 par; issued $2,000,000. Chas. Briggs, president. John S. Dymock, vice-president; Gordon R. Campbell, secretary; Peter Ruppe, treasurer; preceding officers, Jas. Hoatson, Thos. Hoatson, Thos. F. Cole, Chester A. Congdon, Chas. d'Autremont, Jr. and Geo. E. Tener, directors; Saml. A. Parnall, general manager; J. G. Merrill, mine superintendent; A. Houle, smelter superintendent; H. A. Smith, engineer. Merchants & Miners Bank, of Calumet, Mich., registrar. Lands, 11 claims, area 160 acres, in the Warren district adjoining the Copper Queen, also a 600-acre smelter site at Douglas.

The company's shafts are in limestone, with occasional porphyritic intrusions and not far distant from a porphyry contact. Side-line agreements have been secured with the Copper Queen, insuring freedom from possible litigation and a preservation of the present neighborly relations. The surface gives small indications of values, showing but small and infrequent outcrops, the existence of the magnificent ore bodies since developed having been inferred correctly from the underground developments in the adjoining shafts of the Copper Queen and from careful study of the general geological conditions of the district. Ore occurs in highly irregular bodies, the mine showing native copper, cuprite, melaconite, azurite, malachite, chalcocite and chalcopyrite, usually with a talcose gangue and with considerable hematite and manganese ores, the latter carrying malachite in small disseminated nodules and frequently averaging 10% to 18% in copper. The ore is practically self-fluxing and it is with great difficulty that the management holds the average of ores smelted under 10% copper. The ores average about 2 oz. silver and 0.05 oz. gold per ton, as smelted.

The entire mine, so far as yet developed, is on a single claim of 20 acres, the Irish Mag, on which a vertical shaft of 1,280′ depth is sunk, in hard limestone throughout except where cutting the various ore bodies, the shaft being well timbered and safe from drawing. A 17′ body of pay ore was cut above the 700′ level. The mine is opened by drifts and crosscuts on the 750′, 850′, 950′, 1050′ and 1150′ levels, with drift crosscuts begun on the 1250′ level in November, 1903. The upper levels show exceedingly rich ores, there being whole stopes assaying 40%, 50% and even 55% in copper. The lower workings show rich sulphides, and in order to save the high-grade ores in the upper levels, for fluxing and enrichment of the average furnace charges, developme is being pushed more rapidly in the sulphide zone than above, yet practical all of the oxidized ores now smelted come from development work alone. is planned eventually to sink this shaft to a depth of 2,000′, or even mo should the ore bodies hold out. The shaft has 4 compartments and mak very little water, but the mine may become wet at a depth of 1,500′ or mo The ground is exceedingly soft, owing to the amount of talc gangue in the o bodies, and requires heavy timbering. Timber is secured from a great d tance, and to guard against emergencies large stocks are carried. The Iri Mag shaft has developed a mine with ore in sight to run the smelting plant to i full capacity for at least 5 or 6 years to come, without another foot of openin and this single shaft will soon be reinforced by another, to say nothing of tl lower levels now being opened. It is evident that the smelting capacity of tl property must be greatly increased in the near future, as, unlike many copp mines, the mine is crowding the smelter instead of the smelter crowding th mine. The great extent and marvelous richness of the Calumet & Arizona' Irish Mag stopes can be comprehended only by personal inspection. This have given, and know that this statement of the mine's richness is a very con servative one, despite its possible appearance of a contrary nature.

The surface plant is clustered about the shaft on a steep side-hill grade for the purpose. The shaft has a 78′ steel gallows-frame and a 114′ ore bin with a 20x60″ direct-acting Nordberg hoist, good for a depth of about 1,600 and capable of raising a 3-deck cage at the rate of 2,000′ per minute. Th hoist can raise about 500 tons of ore daily, beside caring for men, timbe and tools. The plant includes carpenter and machine shops, smithy, timber mill for framing mine-sets, office building, warehouse, etc. A 25-kw. gener ator supplies electricity for light and power for the ventilating fans.

The Oliver shaft on the Senator claim was 400′ deep at the close of 1903 Separating the Senator and Irish Mag claims is 600′ of territory owned by th Copper Queen, and to the northwest of the Irish Mag is the Spray shaft of th Copper Queen, while to the southwest of the Senator is the magnificent Lowel shaft of the same company. Failure to find an extremely large and rich or body on the Senator claim is practically impossible. A 1,200′ drift from th Irish Mag, through the Pride claim, is within 400′ of the Oliver shaft on th Senator claim, and is in rich ore. The value of the Oliver shaft may be con sidered established, although the ore bodies may not be reached until 400′ t 500′ greater depth. To the southward of the Senator claim No. 2 is the Buck eye claim, with a 40′ exploring shaft and a few trenches, dating from a forme ownership. This claim shows a good iron outcrop and a little low-grade car bonate ore. The southernmost claim is the Gibraltar, wedged between th lands of the Pittsburg & Duluth and Lake Superior & Pittsburg propertie the Gibraltar claim also having shallow exploring shafts and open-cuts showin iron and a little low-grade copper ore of promising appearance. The compan also owns two detached tracts, one being the Wagner and Hope claims, abou 2,000′ southwest of the Irish Mag, while the other group is the Angel, Old Re publican and Washington claims, adjoining the old Copper King mine, on th porphyry side of Tombstone Canyon. The latter group was secured as a possible millsite, but in view of recent developments at the Junction property, may prove to carry workable ore bodies.

The Calumet & Arizona smelter is 25 miles from the mine, near Douglas, ore being transported by the El Paso & Southwestern R. R., which has given a very favorable freight rate. The first stack was blown in November 15, 1902, the second in the spring of 1903, and the third in October, and the fourth was nearly ready for use at the close of the year. The blowing in of the third furnace was taken advantage of to overhaul the first two. With four furnaces in operation the smelter will have a nominal capacity of 1,000 tons daily, and when the present plant is in full operation it will have a productive capacity of nearly or quite 4,000,000 lbs. of refined copper monthly, but owing to the limited hoisting capacity of the single shaft, production cannot be brought to much better than 3,000,000 lbs. monthly until the Oliver shaft begins producing on a considerable scale. Matte is discharged by the furnaces into tilting wells and taken thence by electric crane to the converters, four in number, which turn out 99.2% blister copper carrying small gold and silver values. Power is furnished by a 400-h. p. engine and the handling of raw and finished material is as nearly automatic as possible, in every process of the work. An ample water supply is secured from artesian wells. The mine has no concentrator and needs none, as every pound of ore mined is of smelting grade. Blister copper from the smelter is sent by rail to Galveston, thence by sea to the Nichols Chemical Co. of New York, for electrolytic refining and parting of the gold and silver contents, the refined product being sold through Phelps Dodge & Co. The mining plant and smelter burn both oil and coal.

The production of the Calumet & Arizona in 1902, representing only six weeks of smelting, was 2,066,676 lbs. of refined copper and for 1903 the production was more than 25,000,000 lbs. The first dividend was $1.50 regular and 50c. extra, amounting to $400,000, and was paid in December, 1903, just 13 months after the first furnace of the smelter was blown in, establishing a new record of quick and large profits in successful American copper mining.

The Calumet & Arizona has amply demonstrated its right to be included in any possible list of the world's greatest copper mines, measured by production, prospects or profits. Great as the mine already is, it has but fairly started upon a highly prosperous career. Not only this, but the same management as enjoyed by the Calumet & Arizona is developing sundry other mines in the immediate neighborhood, known as the Calumet & Pittsburg Mining Co., Lake Superior & Pittsburg Development Co., Pittsburg & Duluth Development Co. and Junction Development Co. At these properties the work already done guarantees that the Lake Superior & Pittsburg will make one of the richest copper mines ever opened—probably a much larger mine than the Calumet & Arizona. The Calumet & Pittsburg is also opening well and the prospects of the Pittsburg & Duluth are most excellent, while the Junction is quite certain to have at least a small amount of good ore, with a fair chance of finding large ore bodies. It is an open secret that after these four new properties have been opened sufficiently to determine their

actual values, in all likelihood they will be consolidated with the Ca
Arizona, upon the basis of their relative prospects. This combinat
make one of the greatest, if not the greatest, copper mine in the worl
ther comment would be superfluous.

CALUMET & BISBEE DEVELOPMENT CO. AR

Office: Calumet, Mich. Mine office: Bisbee, Cochise Co., Ariz. I
30 men. Organized Oct. 20, 1902, under laws of Arizona, with capit
$400,000, shares $10 par; 15,000 shares issued and $7.50 paid in.
meeting, second Monday in November. Frank S. Carlton, president
A. Kohlhaas, vice-president; Wm. R. Oates, secretary; J. Wesley D
treasurer; Scott Turner, superintendent; Geo. O. Beehler, clerk. La
claims, area 262 acres, in two groups, known as the Blair and Denn,
Luis, south of Bisbee and adjoining the Lake Superior & Pittsburg
phenomenal ore values were developed in 1903. Price of proper
$154,000. Shaft was started Jan. 12, 1903, and on Dec. 1 had reached
of 960′. Shaft has 3 compartments, each 4x4′6″ inside dimensions, and
sunk and solidly timbered. In June, 1903, the shaft was sunk 137′ b
labor, this being the camp record, and a phenomenal showing in any
Water was struck at a depth of 812′ and the shaft is now making ab
gallons per minute, cared for by substantial sinking and station pump
upper shaft showed occasional nodules of copper carbonates, and tow
bottom a little leached ore and pyrites have been encountered. Dri
started toward the Lake Superior & Pittsburg line on the 950′ level in
ber, 1903. Surface equipment is to include a 14x28″ Nordberg hoist, g
depth of 3,000′ to be installed early in 1904. Present plant has a 14x
drill Norwalk air compressor; one 100-h. p. and two 80-h. p. boilers,
house, office building, boarding house, etc. Company is composed of
high standing and local management is of the best. No money h
wasted and the work performed is first-class in every particular. Ou
properties immediately adjoining working shafts of the Copper Que
Calumet & Arizona, the values of which are more than half establis
proximity to large proven ore deposits, this is one of most promising
developing properties of the Warren district.

CALUMET & COCHISE DEVELOPMENT CO. AR

Office: Calumet, Mich. Mine office: Bisbee, Cochise Co., Ariz. E
about 30 men. Organized 1903, under laws of Arizona, with capital
400,000, shares $10 par; $5 paid in. Annual meeting, second Tue
November. F. S. Carlton, president; Frank A. Kohlhaas, vice-pr
Wm. R. Oates, secretary; J. Wesley Downing, treasurer; preceding
Fred Smith, Richard Edwards, Michael J. Cunningham, John Dani
F. W. Nichols, directors; Scott Turner, superintendent; Geo. O. E
clerk; Ed. Bower foreman. Lands, 14 claims, area 270 acres, held
bond and lease, at price of $150,000; $25,000 paid Feb. 17, 1903; insta
of $12,500 each due Feb. 17 and Aug. 17, 1904, with final payment of $
due Feb. 17, 1905. Property was formerly under option to the
Queen, but was given up by that company. Lands are well located
next southeast of the Lake Superior & Pittsburg, and are among th

promising of the undeveloped properties of the Warren district. [illegible] stains and iron outcrops were noted on surface and a likely [illegible] was cut by the shaft at a depth of [illegible]. Shaft has 3 compartments, well timbered, and was started in the spring of 1903, reaching a depth of nearly 900' at the close of the year. Sinking has averaged nearly [illegible] per month, which is remarkably good work. Water was struck at a depth of [illegible] and the formation at the bottom is softening, these being indications favoring the proximity of a good ore body. Owing to the dip of the copper formation the ore bodies that probably exist on this property may be found at a depth of nearly 1,500'. Equipment is an [illegible] hoist, two [illegible] boilers and a 5-drill Sullivan air compressor. Character and management of this corporation is good, and property is one of great promise.

CALUMET & DULUTH DEVELOPMENT CO. ARIZONA.

Office: care of W. Frank James, secretary, Hancock, Mich. [illegible] Chynoweth, president; C. H. Moss, treasurer. Capitalization [illegible], shares $10 par; issued $20,000. Lands are in the vicinity of [illegible] Springs adjoining the property of the Houghton Development Co., [illegible] miles south of Bisbee, Cochise county, Arizona. Company is awaiting results of development secured at adjacent properties before beginning work.

CALUMET & HECLA MINING CO. MICHIGAN.

Office: 12 Ashburton Place, Boston, Mass. Mine office: Calumet, Houghton Co., Mich. Is one of the largest copper producers of the world, and employs about 5,000 men. Organized 1871, under laws of Michigan, as a consolidation of the Hecla, Calumet, Portland and Scott mining companies and reincorporated, 1900, for 30 years. Capitalization $2,500,000 in 100,000 shares, par $25; $12 paid in. Has paid dividends of $83,850,000 to close of 1903, or $838.50 per share. Has 3,310 shareholders of record. Fiscal year ends April 30; annual meeting is in August. Alexander Agassiz, president; T. L. Livermore, vice-president; Geo. A. Flagg, secretary and treasurer. Alexander Agassiz, Francis L. Higginson, Francis W. Hunnewell, Quincy A. Shaw, Jr., and Jas. N. Wright, directors; James MacNaughton, superintendent; John Duncan, assistant superintendent; Will A. Childs, second assistant superintendent; W. M. Gibson, third assistant superintendent; J. H. Lathrop, chief clerk; Fred S. Eaton, cashier; E. S. Grierson, chief engineer; E. D. Leavitt, consulting mechanical engineer; Jas. Milligan, chief mining captain; W. H. Cake, mill superintendent; Jas. B. Cooper, smelter superintendent at Lake Linden; Morris B. Patch, smelter superintendent at Buffalo; Senator Chas. Smith, chief mill and smelter clerk at Lake Linden; Geo. M. Kendall, chief clerk at Buffalo.

Official returns to the State of Michigan, as of date Jan. 1, 1903, disclose the following figures:

Amount cash paid in on capital stock	$ 1,200,000.00
Entire amount invested in real estate	17,038,135.43
Amount of personal estate	5,684,237.68
Amount of unsecured or floating debt	743,926.19
Amount due corporation	2,162,655.59
Production of copper, 1902	87,094,319 lbs.

Mineral lands are about 2,750 acres, in a compact tract in Sections 11, 13, 14, 15, 22, 23 and 24, Town 56 North, Range 33 West, Houghton county, Michigan, also considerable tracts west of the Tamarack mine, carrying the underlay of the Calumet conglomerate at such stupendous depth that its opening would require a vertical shaft of about two miles in depth. Such a shaft, with necessary equipment, would probably cost no less than eight to ten millions of dollars and the heat at such great depth would prohibit mining, unless artificial refrigeration were provided, while the lode might not be found worth mining. In addition to its mineral lands the Calumet & Hecla owns vast tracts of standing timber, in various portions of the upper peninsula of Michigan and northern Wisconsin.

The Calumet and Hecla mine proper is opened on the Calumet conglomerate, which to the north and south has proven unprofitable wherever mined, though the underlay of the lode, opened by vertical shafts at the Tamarack mine, has given good returns. The average strike of the conglomerate is N. 39° E., with an average dip to the west of north of 37° 30′ with the horizon. The lode has a minimum width of 8′ and a maximum of 40′, with an average of about 12′ to 14′, giving about 2,400 cubic fathoms of stoping ground, equal to about 43,200 tons of stamp-rock, per acre of area. The Osceola amygdaloid, outcropping 730′ east of the Calumet conglomerate, has a parallel strike and an average dip of about 40°. The Kearsarge amygdaloid, which is very rich to the northward, also underlies the Calumet & Hecla lands, outcropping some distance east of the Osceola lode. The amygdaloid walls of the conglomerate carry considerable copper, especially the footwall bed, and much of the adhering trap rock formerly rejected is now milled, causing less rock to be discarded at the rockhouses.

The conglomerate mine, or Calumet & Hecla proper, is developed on the Calumet conglomerate by incline shafts in the Calumet, Hecla and South Hecla branches, and by the Red Jacket vertical shaft, the conglomerate being opened for a distance of nearly two miles along its outcrop. An entirely new mine was opened 1897-1900, on the Osceola amygdaloid lode, parallelling the conglomerate, and another new mine was started on the Kearsarge amygdaloid late in 1903. The Osceola bed is opened by five shafts, Nos. 13 to 17, numbered from south to north and approximately 2,300′ apart, developing about two miles on this lode. The shafts of the Osceola amygdaloid mine are all of large size, well timbered and equipped with powerful hoists, and the new mine has about 20 miles of underground openings, the most extensive ever made in any new property in the Lake Superior district. Work was suspended early in 1901, ostensibly to await the completion of an addition to the Hecla mill, but it is reasonably certain that these shafts will not be worked for several years to come.

The incline shafts on the conglomerate are worked as two separate mines, known as the Hecla and Calumet branches, the South Hecla being a southerly continuation of the Hecla branch. The shafts on the outcrops are as follows, from north to south: 6 and 5 Calumet, two compartments each; 4, one compartment, with a vertical depth of 4,748′ and an actual depth of 8,100′ at an angle of 37° 30′; 3 and 1, abandoned; 2, one compartment; 1, Hecla, abandoned 3, 4, 6, 7 and 8 Hecla, one compartment each; 9 and 10 Hecla, two compartments; 11 and 12 South Hecla, one compartment each; 13, 14, 15, 16 and 17 Amygdaloid, on the Osceola lode, two compartments each; No. 18, the Red Jacket vertical, sunk to some distance west of the conglomerate outcrop to intercept the underlay, six compartments.

The Red Jacket vertical shaft was started in 1888 and cut the lode at a depth of 3,287′. It is bottomed at a depth of 4,920′. When first bottomed the rock temperature in the sump was 87.60° Fahrenheit (31° Centigrade.) After connection was secured with No. 4 Calumet the temperature was reduced to between 70° and 80° Fahrenheit, exhaust air from the power drills also aiding in cooling the mine. The Red Jacket shaft was designed to open a mine unconnected with the older workings in order to give reserve stopes in case of a mine fire, but the heat and danger were so great that connection was made with the older shafts. The conglomerate lode at this point and depth is not up to its usual value, being wide but considerably below the Calumet & Hecla average values in copper.

The Calumet & Hecla owns 200 acres, known as the "five forties," between the Tamarack and the Tamarack Junior mines. This carries the underlay of the conglomerate at great depth, and to obviate sinking a deep and costly vertical shaft this tract is being opened by a blind shaft, which starts 1,500′ east of the Red Jacket vertical, and near the bottom of No. 4, which abuts on the Tamarack boundary line at a depth of 8,100′. No. 4 has opened some of the best ground of the entire mine, the lode having an extreme width of nearly 40′ at points, and being notably rich from the 3,600′ to the 4,500′ level. The blind shaft is being sunk 25′ under the footwall, at the same angle as the dip of the conglomerate, thus assuring solidity of walls without necessitating long and expensive crosscuts to the lode on each level. Beginning at a depth of 5,700′ to open a new mine under an old one is certainly a novelty in mining practice. As a rule the richer portions of the conglomerate are in the central part of the Calumet & Hecla tract, the most notable exception being in No. 4 Calumet shaft. Nos. 10 and 12, the southernmost shafts of the South Hecla, are being gutted, pillars being robbed from the bottom upward. Hecla shafts 6, 7 and 8 show very good ground. No. 7 is 6,100′ and No. 8 is 6,300′ in depth. To the north of No. 5 Calumet there is a considerable stretch of lean ground up to the north boundary.

Pillars 75′ wide are left on either side of every shaft, and when the present conglomerate workings are exhausted down to the Tamarack line, the pillars will give a product equal to about 18% of all the rock previously mined. The mine is opened for about 8 years in advance of immediate requirements, possibly too far ahead for such soft ground, and has about 200 miles of shafts, drifts, winzes and crosscuts. The quantity of timber used in the mine is about 30,000,000′ annually. Electric pumps are in use at several of the shafts and are said to be giving satisfaction.

Work on exploratory development of the Kearsarge lode was begun in August, 1903, by a temporary vertical shaft, from whence a crosscut located the lode, which promises well. An incline shaft will be holed through to surface when the permanent angle of the lode is determined by sinking to sufficient depth thereupon. The shaft is about a quarter-mile south of the Centennial line, and near the close of 1903 a second shaft was started, 1,500′ southward. Should the Kearsarge lode prove rich under the Calumet & Hecla's entire tract, it would make a mine inferior only to the Calumet & Hecla proper and Copper Range Consolidated among all Lake Superior copper properties. The Kearsarge lode is rich for many miles to the northward, but is apparently worthless a few miles southward, hence its real value at this point can be demonstrated only by actual development upon a considerable scale.

The Calumet & Hecla has suffered severely from underground fires. The amygdaloidal trap rock carrying native metal cannot burn, like the copper ore mines rich in sulphur, such as the Anaconda, United Verde, Mountain and others, but the old timbering eventually becomes nearly as inflammable as so much tinder. All mine timber is partially fireproofed with a chloride of zinc solution before going underground, and the shafts are regularly sprinkled. The really serious mine fires have been five in number, occurring in 1884, in July and November 1887, and on Nov. 30, 1888, and May 27, 1900. All possible precautions are taken against mine fires, these including water-pipes and hydrants, fire-hose, chemical engines, an electric system and 18 telephones at various pump stations from the 8th to the 51st levels inclusive, in five different shafts, so distributed as to be most readily accessible from all parts of the mines. From the first four fires the Calumet & Hecla suffered aggregate losses of several millions of dollars, while a number of lives were lost and three valuable shafts were so badly drawn that they were abandoned. The fifth and latest fire, in May 1900, severely tested the mine's system of fire prevention and extinguishment, but the result was favorable. The fire broke out on Sunday evening, when the mine was deserted by all but a few employes, and had gained great headway before it was discovered and the burning portion of the mine shut off by closing the fire doors. The mine was sealed at surface by covering the mouths of the shafts with heavy timbers and tamping dirt tightly into the crevices between. Wherever gas escaped through holes in the earth, dirt was tamped in and made solid with water. The fire was extinguished in three weeks and the South Hecla portion of the mine continued working without interruption. The five serious fires and sundry smaller blazes nipped in their inception have all been of mysterious origin, and there are grounds for suspecting incendiarism. Great precautions are taken to prevent unauthorized persons entering the mine, and permission to go underground is given only by the president, in writing, each pass being for one trip only.

The surface equipment of Calumet & Hecla is the most complete owned by any mine. With rare exceptions everything is duplicated, to prevent possible delays or suspension through fire or accident. The carpenter shops are of great size and fitted with every modern wood-working appliance. The smithies are larger than may be found elsewhere outside of the works of a few of the very largest machinery manufacturers, and are supplied with steam-hammers, forges, blowers, emery-wheels, grindstones, etc. The Calumet smith shop sharpens upwards of fifty tons of steel drills daily, requiring the services of a small regiment of drill boys for transport between the shops and mines, while forging and general blacksmithing are done at the Hecla shops, to which a stone addition of 56x152′ was built in 1903. Upwards of one hundred blacksmiths are employed in the various shops. The machine shop is 225x250′ and is very complete in equipment, turning out an immense variety and quantity of work. The company has no foundry, but three large and modern foundries operated by private enterprise are located nearby. The company has a very large brick warehouse for general supplies, and special warehouses for steel and iron, paints, etc., all having direct connection with the Hecla & Torch Lake Railroad, a private line operated by the company that connects the mine, mill and smelter by some 20 miles of main track, spurs and sidings that reach every shaft, shop, warehouse and mill. The road has big locomotives and a large equipment of rolling stock, though its cars are of small capacity.

The shaft-rockhouses at the incline shafts are of uniform pattern. At each the rock is hoisted to the top of the shafthouse, passing thence over grizzlies that allow the finer rock to fall through, the larger masses being reduced in 2x3′ crushers of the jaw type, and going to 18x24″ crushers on the floor below. The crushed rock falls by gravity into storage bins, whence it is dumped into hopper-cars that take it to the mills, railroad tracks running underneath each rockhouse. Experiments made in 1903 will propably lead to a radical change in the entire plan of crushing. New Farrel crushers with wide angle openings and 4″ apertures at the bottom reduce the rock in a single crushing, and, contrary to all engineering theory, have proven themselves durable, economical and highly efficient. They will probably be put in use at all shafts.

The hoisting engines of this mine are among the most powerful in the world, ranging from 1,000 to 8,000 h. p. each. Miners are taken in and out of the incline shafts by man-cars, these being long trucks having tiers of circus seats, and replacing the regular skips when needed, being quickly shifted on or off the skip-tracks by powerful cranes. This method has proven the safest, cheapest and quickest yet devised for moving men in and out of deep incline shafts.

At No. 4 Calumet shaft there is a group of the most powerful machinery ever built. The brick engine house, 62x146′, contains the Corliss engine "Superior," of 4,700 h. p., with 40″ cylinders and 70x72″ stroke; the auxiliary engines "Baraga" and "Rockland," of 2,000 and 600 h. p. respectively; two Rand air compressors of 25 and 40 drill capacity, and the engine "Mackinac," a quadruple-cylinder triple-expansion steel giant of 7,000 h. p., operating 3 Nordberg air compressors with a combined capacity of 500 drills. In the old Leavitt compressor water was injected into the compression cylinders, while the Nordberg machines deliver the compressed and greatly heated air to a cylindrical steel cooler 12′ in diameter and 30′ high, into which water is sprayed from above and drawn off at the bottom, this cooling the air to 80° Fahrenheit

(27° Centigrade). The hoist has four drums, each 8′ 6″ wide and 20′ 6″ in diameter, operating four different shafts, two of these drums carrying more than one and a half miles of steel cable each. Power is supplied by batteries of boilers in two boiler-houses adjoining, these having a brick chimney 250′ high, with inside diameter of 12′ 6″. Locomotives haul the coal into the boiler-houses, where it is fed into the grates by automatic stokers.

The Hecla engine-house is of brick, 47x80′ in size, flanked by a large boiler-house, and contains the compound hoisting engine "Frontenac" of 2,000 h. p. and two auxiliary engines of 600 and 900 h. p., also a 30-drill Rand air compressor and a pair of water-plunger air compressors with a combined capacity of 144 drills—the largest machines of this type ever constructed. South of the Hecla plant is the engine house known locally as the "G. H. & S.," from the initials of its three former engines, the "Gratiot," "Houghton" and "Seneca," of 2,000 h. p. each. The "Gratiot" was remodeled and removed to the stamp mills in 1902, and alterations made on the "Houghton" and "Seneca" enable them to do the work formerly requiring three engines. The Hecla boiler-house has 5 large boilers and a 200′ smokestack of 9′ 6″ internal diameter.

The engine house operating Hecla shafts 7 and 8 contains the engines "Hancock" and "Pewabic," each of 2,000 h. p., which operate 25′ drums by spur gearing, and a 5,000-h. p. Leavitt engine for man-cars. A 50x120′ boiler-house has 10 boilers and a 250′ smokestack of 12′ 6″ internal diameter. Electric pumps were installed in No. 7 Hecla in 1902. Similar pumps have been in use in the Calumet branch for some years and are said to be giving efficient service. The engine house serving shafts 9 and 10 South Hecla contains the engines "Detroit" and "Onota," of 1,000 h. p. each, and the engine house at shafts 11 and 12 has hoists of similar capacity.

The Red Jacket shaft has a quadruple hoist of 8,000 h. p. in a 70x220′ brownstone building In an adjoining brownstone building of 70x150′ are ten 1,000-h. p. boilers. At the rear of the engine house is a 32x412′ brownstone annex, floored with cement and roofed with slate in which is carried the fleet-gear. In raising ten-ton loads perpendicularly from a depth of one mile the weight of the cage and steel cable nearly equals that of the cargo of rock, but with the aid of counterbalance the engines can hoist ten-ton loads at a speed of 40 miles per hour, the regular hoisting time being about 90 seconds for the vertical distance of nearly a mile, this including time taken for starting and stopping, an achievement no locomotive could duplicate on a horizontal plane. The engine operates on the well-known Whiting system, devised by S. B. Whiting, formerly general manager of the company. To overcome the dangerous strain caused by unequal wearing, Walker differential rings were placed on the sheaves in 1903, with excellent results. The steel combination shaft-rockhouse, 100′ square and 110′ high, is fitted with breakers capable of crushing 1,000 to 2,000 tons of rock daily. The boiler-house smokestack is 250′ high, with 12′ 6″ inside diameter The hoisting capacity of the vertical shaft was always disappointing, until greatly increased in 1903 by replacing the old cages with 7-ton self-dumping Kimberly skips, swung under the cages.

Nine-ton pockets have been built underground for loading the skips, which dump automatically on surface. The saving in time and labor is very great and the changes named have nearly doubled the productive capacity of the shaft. In addition to the usual pumps the Red Jacket has 3 [illegible]-gallon steel bailers. The shaft is to have a vertical duplex compound Riedler air-compressor of Allis-Chalmers make, driven by a vertical compound condensing King engine. Each section will compress 14,000 cubic feet of free air per minute to a pressure of 70 lbs. per square inch, giving capacity to furnish power for 275 drills each, or 550 drills for the duplex machine. This compressor will cost $350,000, with foundation.

Among miscellaneous surface improvements is a 74x74' stone building housing the electric plant that furnishes light on surface and power to certain of the pumps underground.

There is a timber mill that mortises and tenons the bed-pieces, legs and stulls of the square sets used underground, a large paint shop, offices, barns, etc., and a private telephone exchange with 100 instruments is maintained.

The company owns about 1,200 houses, occupied by employes at an average rental of 6% interest on actual cost, plus cost of maintenance, and upwards of 1,000 dwellings are owned by employes on lands leased from the company at low yearly rentals. The Calumet & Hecla also owns a large hotel and a fine stone clubhouse for employes, this containing bath-rooms, bowling alleys, etc. A free library of more than 16,000 volumes contains books printed in a score of languages, 30 different nationalities being represented on the company's payroll. There is also a combination library and clubhouse at Lake Linden, for the employes of the stamp mills and smelters. There are some 30 churches on the company's lands, occupied by a dozen different denominations, and for all these churches sites were donated and in most cases substantial aid has been given in their erection and maintenance, entirely regardless of creed. There are also eight schools on the Calumet & Hecla lands, most of which were built by the corporation.

The company maintains a hospital, for employes solely, built in 1898 and noted for its complete surgical and laboratory apparatus. Nearly a dozen physicians on the hospital staff are at the call of any employe requiring medical or surgical attendance. In 1877 an aid fund was instituted for employes, and is managed by directors chosen by the workmen. This fund pays death and disability benefits, enormous sums having been disbursed since the formation of the fund, every dollar going to the sick and injured, or to families bereaved of their bread-winners by accident or disease. Surplus moneys accumulated in this fund have been invested in the company's shares, bought on the open market, and these investments have been highly profitable. Disbursements from this fund were $66,489.70 for the year ending April 30, 1902, and the value of the fund, at cost price of stock held, which is considerably less than the market value, was $136,234.80 at that date. For the maintenance of this fund each employe pays 50 cents monthly and the company adds an equal amount. This is not called charity, but it certainly is practical philanthropy of a noble sort.

Three systems of water works are maintained, two at Calumet and one at Lake Linden. One of the former furnishes water from dams for fire protection, and the other pumps potable water 4 miles from Lake Superior against a head of 600′, raising about 4,000,000 gallons daily. At the dam and mine there are 7 pumps, with a combined daily capacity of upwards of 45,000,000 gallons.

The company maintains a fire department, modeled on metropolitan lines, which affords protection to the mine buildings and location, and also responds to calls from the town of 35,000 souls that has grown up about this great mine.

The stamp mills are located at Lake Linden, four miles from the mine, on a tract of about 988 acres, which has several miles of frontage on Torch Lake. There are two wooden mills, the "Calumet" and "Hecla," each of which originally had 11 Leavitt steam stamps, with cylinders 14x21½″ and 24″ stroke. An addition to the southern end of the "Hecla" mill, completed in 1903, is 165x308′, of steel, built by the American Bridge Co. This has 6 stamps, each run by an independent 25-h. p. electric motor. The new mill is thoroughly modern and of great capacity. Among the new features are 7 Chilean regrinding mills, in addition to the old Averley grinders, and enlarged finisher jigs. The new plant handles material with about 60% of the wash-water formerly required, thus effecting an immense saving, inasmuch as all water used in the mills must first be pumped in and thereafter raised as sludge in the sand-wheels.

Upon the completion of the "Hecla" addition, early in 1903, the work of rebuilding the old mills was begun. Each mill was divided into two sections and one section at a time will be rebuilt, the new "Hecla" addition but little more than taking the place of the sections under reconstruction. Each section will require fully a year for rebuilding, and the remodeling will scarcely be completed before 1907. While this work is called rebuilding, it is nothing short of building absolutely new mills on the site of the old, the work being done piecemeal because it cannot well be done otherwise. Probably not a single machine, plank or bolt in the old mills will ever enter the new. Notable features of the new construction are the replacing of wood with steel and cement throughout, the building of much heavier foundations and considerable additions to the wash-room below the stamps and coarse jigs. Work was begun on the southern half of the old Hecla mill and this section was nearly rebuilt at the close of 1903. The new section, built by the Wisconsin Bridge & Iron Co., has a heavy steel frame, concrete foundations, cement floors, corrugated iron siding and a Carey roof of tarred burlap. This section will have 5 Leavitt stamps, Woodbury-Benedict jigs, 4-deck Evans-Rawlins slime tables, Chilean regrinding mills, classifiers and Wilfley concentrators, the latter to be built in the Calumet & Hecla shops by special arrangement with the owners of the patents. The mills already have 80 Wilfleys and will build 140 additional machines. The Parnall-Krause pneumatic stamp is being tested for recrushing gravel from the Leavitt heads, and gives much promise. Work on reconstruction of the north section of the mill will begin early in 1904. The houses, etc. The boilers at the mill plant consume about 500,000 gallons of water daily, secured from a reservoir, artesian wells and Torch Lake. Trouble from impure water has been solved by the installation of a Jewell filtration plant of 500,000 gallons daily capacity, in which the impurities originally found in the water are precipitated by lime.

The tailings at the Lake Linden mills are the most extensive in the world containing nearly 30,000,000 tons of stamp sand carrying from about 0.4% in the newest parts up to nearly or quite 1% copper in the older sections. The total amount of copper in these sands is probably almost 200,000 tons. Experiments in reworking the sands by the Taylor-Woodworth automatic slimes system were apparently unsuccessful, the experimental plant having been demolished.

The Calumet & Hecla has smelting plants at Lake Linden and Buffalo. The former works, opened in 1887, now cover the major part of a 30-acre tract lying about a mile south of the mills. There are four furnace buildings, each 80x130′, a blister copper furnace building 50x70′, warehouse, laboratory and assay office. machine shop, boiler house and three mineral houses with a combined storage capacity of 18,000 tons. The mineral comes from the mills carrying nearly two-thirds metal to one-third gangue rock, instead of three-fourths metal, as some years ago, the dressing of mineral to a lower tenor in copper permitting the saving of much fine copper formerly lost in the slimes. The furnaces are of the reverberatory type, except the blister copper cupolas, and have been rebuilt and greatly enlarged during and since 1900. The increased capacity has been found highly economical. The new reverberatories have 93′stacks and are top-charged, the mineral being thoroughly dried on platforms above the furnaces before charging. The largest blast furnace is 40x96″ at the tuyeres. The eastern reduction plant, known as the Buffalo Smelting Works, is located on the Niagara River, at Black Rock, Buffalo. with deep water in front and direct rail connections in the yards. The Buffalo plant was established in pursuance of the company's policy of duplicating every vital part of the mine, mill and smelter, and has grown rapidly, now covering a considerable area. This plant also has a 30-ton electrolytic refinery for refining certain grades of mineral carrying considerable silver values. The Buffalo plant employs about 150 men.

Sufficient mineral is shipped during the season of lake navigation, April to November, to keep the Buffalo works supplied for the entire year. The highest grade mineral goes east for smelting, thus saving freight charges. The company operates a fleet of steel steamers and barges for carrying down mineral and bringing back soft coal, the fine steel steamer Geo. A. Flagg, of 3,300 tons register, being of this fleet. There is a series of very large coal sheds at Lake Linden, one of which has 200,000 tons capacity, the old sheds being of wood and the new of steel. There is also a series of docks at the mills and smelts on Torch Lake, all with substantial wharves having at least 21′ of clear water alongside, frequent dredging being required to maintain the depth of clear water, owing to the stamp-sand filling in. The Calumet & Hecla owns and operates the ship canal connecting Torch Lake with the government waterways on Portage Lake. This canal is 21′ deep and accommodates the largest vessels plying the great lakes. Tolls ranging from 10 cents on soft coal to 50 cents per ton on package freight are charged on cargoes entering Torch Lake through this canal.

A sawmill at the head of Torch Lake, built in 1901, receives logs by raft and ships sawed lumber and timber by a branch of the company's railroad. At the mouth of the Sheldrake river, on Whitefish Point, Chippewa county, Michigan, the company has a mill sawing about 12,000,000 feet of lumber yearly, with 10 years supply of standing timber tributary thereto. The company also has a mill at Ashland, Wisconsin, and owns extensive tracts of pine, hemlock and hardwood at various points along the southern shore of Lake Superior, in addition to which much timber is bought of jobbers.

Detailed annual statement of production and dividend payments will be found in the statistical chapter. The dividends of $83,350,000, paid by the Calumet & Hecla to the close of 1903, are the largest ever disbursed by any mining corporation.

The following table gives comparative financial statements for the three fiscal years ending April 30, 1903, 1902 and 1901.

Assets.	1903.	1902.	1901.
Cash and copper	$ 6,118,435	$ 3,950,575	$ 3,487,856
Bills receivable	509,584	366,658	382,011
Insurance fund	606,859	149,936	....
Total	$ 7,234,879	$ 4,467,171	$ 3,869,867
Liabilities.			
Drafts and bills payable	373,681	502,816	760,899
Contracts for machinery	304,175	371,575	640,838
Cash for improvements	....	....	300,000
Total	$ 677,856	$ 874,391	$ 1,701,737
Balance	$ 6,557,023	$ 3,592,779	$ 2,168,130

A statement of date June 30, 1903, filed with the Massachusetts commissioner of corporations, discloses the following figures:

Assets.	
Real estate and machinery	$ 17,977,064
Cash and accounts receivable	2,192,025
Material and stock	4,054,079
Total	$ 24,223,169
Liabilities.	
Capital stock	$ 1,200,000
Accounts payable	557,005
Surplus	22,466,1
Total	$ 24,223

The preceding figures show a net surplus in quick assets—cash, bills receivable, supplies and copper—of $5,689,099. As a matter of fact the copper on hand was figured at less than actual value, in pursuance of the conservative policy, followed for many years, of estimating assets on the lowest possible basis, and including all unaccrued and contingent items in the total of liabilities.

For the five years ended April 30, 1903, the Calumet & Hecla paid dividends of $27,500,000 from net earnings of approximately $28,550,000.

The statistical confusion so frequently noted in figures of Calumet & Hecla production is caused by the use of four sets of figures of production of refined copper, to say nothing of two sets of figures of output of crude mineral (unsmelted copper), and numerous estimates of more or less authenticity. The four sets of official figures of annual production are for actual output of refined copper, and also quantity of fine copper contained in mineral produced, for the calendar year, and also for the company's fiscal year. Figures used in this publication are those of actual outputs in refined copper by calendar years. For the calendar year 1902 the mine made mineral equivalent to 87,094,319 lbs. of fine copper, but actually produced only 81,248,739 lbs. of metal. At the close of 1903 the mills were stamping about 5,700 short tons of rock daily, carrying average values of about 2.5%, or 50 lbs. refined copper per ton, which, from approximately 1,750,000 tons of rock crushed yearly, would give a return of 87,500,000 lbs. of refined copper. The actual production is more apt to slightly underrun than to exceed this figure, but barring serious accidents the variation either way will be small during 1904, but will probably show very small successive increases in 1905 and 1906. What the production of the company will be after the reconstruction of its mills is completed, is conjectural, depending upon such factors as whether the additional rock milled comes from the Kearsarge or Osceola lodes, thus rendering long-range forecasts of little value. All that can be said with safety is that the Calumet & Hecla will probably maintain its present rate of production, with possibly a small annual increase, until 1907, in which year, if all goes well, the output of refined copper may exceed one hundred million pounds for the first time.

The administrative policy of the mines, mills and smelters has been greatly modified since the appointment of James MacNaughton as superintendent, in July, 1901 He was doubtless chosen for the purpose of making the changes thus accomplished, as he had made an enviable record as a successful and economical, though not a parsimonious, mine manager. Wages have not been reduced, men have not been overworked, and none of the company's numerous philanthropical enterprises have been discontinued or curtailed in efficiency, but there has been a gradual closing up of the ranks, a stopping of numerous petty leaks and a keener scrutiny of expenditures, which has saved some millions of dollars for shareholders. The cost of mining, milling and smelting each ton of rock treated was $6.77 in the company's fiscal year 1900, and but $3.57 in the year ending Apr. 30, 1903. The cost of refined copper has been approximately as follows, for the past four fiscal years: 1900, 8.99c.; 1901, 10.55c.; 1902, 7.25c.; 1903, 7.00c.

The policy of the Calumet & Hecla is one of absolute independence. It cannot be cajoled, coerced or bribed into entangling alliances of any sort. Speculative gossip connecting the Calumet & Hecla with pooling arrangements made by the Amalgamated Copper Co. is founded solely on lies and misapprehensions. Furthermore, newspaper talk and bucket-shop "tips" that the Amalgamated is to do this, that and the other thing to the Calumet & Hecla, may be disregarded as entirely unfounded. The position of the Calumet & Hecla is absolutely impregnable; it has no debts and its only liabilities are of a contingent or fiduciary nature, and even these could be paid in full, in cash, on a day's notice. As compared with Amalgamated, so often quoted as about to do something harsh to the Calumet & Hecla, the latter named corporation has dividends to pay on two and a half million dollars only, as against an inflated stock issue of one hundred and fifty-five millions by Amalgamated, yet Calumet & Hecla is making nearly half as much copper as Amalgamated, and is making it very much cheaper. The price of the metal cannot be put low enough for the Calumet & Hecla to lose on a single pound of copper made, but this is not true of Amalgamated. Calumet & Hecla has no interest in the stock market, no friends to protect or enemies to punish, no program calling for borrowing, lending or financial juggling. Furthermore, it has no newspaper organ, never had one, and never will have one. There are enough honest newspapers in the United States to guarantee that this noble old corporation with a soul, a heart and a conscience, will never lack journalistic defenders, though it is well known that the company neither rewards flattery, nor dignifies calumny by the slightest notice.

CALUMET, HECLA & SONORA MINING CO. MEXICO.

Office: Duluth, Minn. Said to have 1,000 pertenencias of mineral lands in Sonora, Mexico.

CALUMET & MONTANA DEVELOPMENT CO. MONTANA.

Former office: Calumet, Mich. Out of business, except litigation.

CALUMET & PITTSBURG MINING CO. ARIZONA.

Office: Calumet, Mich. Mine office: Bisbee, Cochise Co., Ariz. Organized December, 1903, under laws of Minnesota, with capitalization $2,500,000, shares $10 par; $5 paid in and $5 payable Mar. 26, 1904; unissued, $500,000. Succeeds the Calumet & Pittsburg Development Co., taking over the assets and liabilities of that corporation, shareholders of which were given two and a half shares in the new company for one in the old with an opportunity to subscribe for the same proportion of new shares at par. Every share of the new stock was taken by shareholders of the development company, so that no stock went to outsiders. Chas. Briggs, president; John S. Dymock, vice-president; Gordon R. Campbell, secretary; Peter Ruppe, treasurer; Saml. A. Parnall, general manager. Company has same officers and local management as the Calumet & Arizona, with mainly the same shareholders, and is closely affiliated with that corporation. Lands, 19 patented claims, area 250 acres, in the Warren district, lying southeast of the Calumet & Arizona and the Lowell shaft of the Copper Queen. Cost of lands was $937,451.75. Main shaft was 925' deep at close of 1903, and is to be sunk at least 200' deeper. The Junction Development Co. is also sinking a 4-compartment shaft on the boundary line of that company with the Calumet & Pittsburg, shaft being sunk with a view to taking ore from both mines. The shaft is unusually wet for the Warren district, requiring heavy pumping. General geological conditions are much the same as at the Copper Queen and Calumet & Arizona. Power plant has 7 boilers, to be materially increased. Petroleum is used for fuel. Some small ore bodies have been encountered, and these give every indication of being the tops of large and rich ore deposits similar to those developed in adjoining properties. The present company would probably not have been organized so soon had it not been for the necessity of providing large sums for the final payments on the lands held under bond and lease. There are many reasons, however, for thinking that the Calumet & Pittsburg will make an excellent mine.

CALUMET & TEXAS MINING CO. **TEXAS.**

Office: Cedar Rapids, Iowa. Mine office: Carlsbad, N. M. Employs [illegible] men. Organized May, 1901, under laws of New Mexico, with capitalization $250,000, shares $1 par. John H. Shary, president and general manager; Wm. Fullerton, secretary; Alfred C. Sieboth, consulting engineer. Lands, 36 claims, area 720 acres, also 640 acres of oil lands, in the Guadalupe mountains, El Paso county, Texas, showing an ore body giving assays of 20% copper, 5% lead and 1 oz. silver per ton, with a trace of gold, from carbonate ores, opened by tunnels of 40', 200', 210' and 328'. Nearest railroad, the Pecos Valley & Northeastern, is 64 miles distant. Production of copper in 1903 was about 50,000 lbs., secured from tests of about 100 tons smelted. Company plans continuing development work vigorously.

CALUMET & WESTERN DEVELOPMENT CO.

Office: care of F. S. Carlton, president, Calumet, Mich. John Daniell, secretary; W. B. Anderson, treasurer. Organized 1903, under laws of Arizona, with capitalization $6,000,000, shares $1 par, in 100,000 shares of 7% preferred stock and 500,000 shares of common stock. Company is an exploratory, development, promotion, and investment corporation, planned to operate in any section of the United States, Canada or Mexico. Present holdings include the Globe zinc mine, near Joplin, Missouri.

CAMBRIAN COPPER MINING CO., LTD. **WALES.**

Offices: 19-21, Queen Victoria St., London, E. C., Eng. Mine office: Caerwych, Merionethshire, Wales. Scott D. Cropper, secretary. Capital, nominal, £60,000; issued, £45,127. Property is the Caerwych mine.

CAMBRIAN MINING & MILLING CO. **CALIFORNIA.**

Mine office: Placerville, El Dorado Co., Cal. F. Thomas, president; Leonard Thomas, general manager; D. R. Roberts, superintendent. Mine has 3 parallel veins, averaging 6' to 8' wide, with gangue of talcose schist and lime, between diorite and serpentine, showing cuprite, malachite and sulphide ores, with native copper in the alteration zone, ores carrying 8% to 16% copper and good gold values. Mine has considerable underground development.

CAMBRIDGE COPPER MINING CO. **NORTH CAROLINA.**

Formerly operated a mine near Jamestown, Guilford Co., N. C. Letter returned unclaimed and company probably dead.

CAMOS MINING CO. **IDAHO.**

Had gold-copper claims near Doniphan, Blaine Co., Idaho, with A. J. Borrall, manager. Letter to company returned unclaimed.

CAMOS NO. 1 MINING CO. **IDAHO.**

Had gold-copper claims near Doniphan, Blaine Co., Idaho. A. J. Borrall, manager, at last accounts. Letter to company returned unclaimed.

CAMP BIRD EXTENSION MINING CO. **COLORADO.**

Office: Boston Bldg., Denver, Colo. Mine office: Ouray, Ouray Co., Colo. M. L. Thistle, superintendent. Ores carry gold, silver, lead and copper. Has water and electric power and employs about 40 men.

CAMP VERA GROUP. **CALIFORNIA.**

Lands are in the Morrow district of San Bernardino county, California. Letter addressed to J. W. Rodgers, owner, Barstow, Cal., returned unclaimed.

CAMPANARIO MINES. **SPAIN.**

Address: care of Don Antonio Guijarro, Orta, Huelva, Spain. Mines, at Valverde del Camino, Huelva, consist of a group of six properties, area 47 hectareas, on which iron-copper sulphides are being developed.

CAMPRODEN COPPER SYNDICATE, LTD. **SPAIN.**

Offices: 3, Lord St., Liverpool, Eng. Wm. E. Mounsey, chairman; T. W. Stanfield, secretary. Capital, nominal, £5,000. Organized to acquire mining lands in the province of Gerona, Spain.

CANADIAN COPPER CO. **ONTARIO.**

Office: 12 Wade Bldg., Cleveland, Ohio. Mine office: Sudbury, Algoma, Ont. This is the world's largest producer of nickel, and is controlled by the International Nickel Co., through ownership of nearly the entire stock issue. R. G. Leckie, general manager. The property was discovered in 1882 and opened in 1886. Lands are extensive and include the Stobie mine in Blezard Twp., 4 miles north of Sudbury, the Evans, McArthur 1 and 2, McDonald, Clara Belle A and B, and other mines, in addition to the older and principal workings, about 1,000′ in depth, at Copper Cliff. Ore is nickeliferous chalcopyrite with pyrrhotite gangue, occurring as irregular lenses in basic igneous rocks, mainly greenstone and diorite. Ore is heap-roasted at the mine and matted at the Sudbury smelter, 3 miles distant. The roast-heaps contain 4,000 to 5,000 tons each, roasting requiring three or four months. The product of first fusion is a matte of 30% to 35% tenor in combined nickel and copper, the second fusion giving an 80% matte, which is shipped to the Orford works at Constable Hook, N. J., and smelted with sulphite of soda, by which the separation of the nickel and copper is effected, the resultant copper product being refined electrolytically. The ore gives average returns of about 2.75% copper and 2.5 nickel. A new smelter, now under construction, is planned quite closely along the lines of the Tennessee Copper Company's plant, which has secured such remarkable good results. The new works will have two water-jacket blast furnaces and a conversion plant. Annual production is about 5,000,000 to 7,000,000 lbs. of refined copper and 3,500,000 to 6,000,000 lbs. of nickel.

CANADIAN MINING & DEVELOPMENT CO. MONTANA.

Mine office: Basin, Jefferson Co., Mont. Lands, 10 claims, having considerable development, and shipping gold, silver, lead and copper ores to smelters. Said to be under bond and lease to eastern parties.

CANADIAN SMELTING WORKS. BRITISH COLUMBIA.

Office and works: Trail, B. C. Supposed to be owned by the British Columbia Southern Railway Co., which is operated by the Canadian Pacific Railway. This is the largest lead-copper reduction plant in Canada, with daily capacity of about 300 tons. Is operated by electrical power brought about 30 miles, from the Kootenay river. Line current is 20,000 volts, stepped down to 550 volts at the smelter, giving a total of 1,000 h. p., in motors divided into 16 units. Smelter treats custom ores exclusively, brought from all parts of British Columbia, but principally from the Rossland district. Plant includes a 100-ton Gates crusher, 3 Vezin automatic samplers, Jones riffle sampler, and three 300-ton copper furnaces, with automatic feed. Ore and fluxes are handled in hopper cars, drawn by 10-h.p. electric locomotives. The first matte contains 10% to 12% copper only, which is granulated and roasted in two O'Harra furnaces, after which the calcined matte is briquetted and resmelted, running 50% to 55% in tenor. Works include a very complete lead-smelting plant, handling silver-lead-zinc ores, and including an experimental electrolytic lead-refinery. Smelted about $3,500,000 worth of gold, silver, copper and lead ores in 1903. Management is energetic, highly enterprising and of great benefit to British Columbian mining interests.

CANADIAN-AMERICAN MINING CO. BRITISH COLUMBIA.

Property is on Gribble Island, off the coast of British Columbia. Is said to have contracted, late in 1903, for regular shipments to the Tyee smelter at Ladysmith.

CANANEA CONSOLIDATED COPPER CO., S. A. MEXICO.

This company, incorporated under Mexican laws, holds direct title to the mines of the Greene Consolidated Copper Co., the Greene Company owning the stock of the Cananea Consolidated.

CANDELA MINE. MEXICO.

A property in the state of Michoacan, Mexico, the owners of which are said to be opening a large body of low-grade sulphide ore in a deliberate manner. Local conditions supposed to be much the same as at the Inguaran.

CANDELARIA MINE. MEXICO.

Mine office: Chacala, Durango, Mex. Owned and managed by P. G. Dismukes, T. L. Dismukes and J. S. Wilkinson. Ores carry gold, silver and copper, and are bismuthiferous. Has steam power, Bryan mill and 6-ton chlorination plant.

CANDELARIA MINING CO. MEXICO.

Office: El Paso, Texas Mine office: San Pedro, Chihuahua, Mex. Britton W. Davis, president; David B. Smith, superintendent. Operates the

Candelaria, Congreso, San Nicolas and other mines, producing gold, silver, lead and copper, the latter in small quantities as a by-product. Ore bodies are in slate, and somewhat erratic. Main shaft, 900′; tunnel, 800′. Has steam and electric power, concentrator and smelter. Employs upwards of 1,000 men. Company is a dividend payer.

CANDELARIA MINING & EXPLORATION CO. **MEXICO.**

Office: Colorado Springs, Colo. Mine office: Parral, Chihuahua, Mex. H. L. Browne, superintendent. Ores carry gold, silver, lead and copper. Main shaft, 150′, also a 175′ tunnel. Has steam power, 5-stamp mill and 25-ton cyanide plant. Property thought to be valuable, but idle through lack of funds.

CANTON COPPER MINE. **GEORGIA.**

An old and idle property in Fannin county, Georgia. Main shaft, about 300′. Ores occur as chalcopyrite impregnations in micaceous schist.

CANYON COPPER CO. **ARIZONA.**

Office and mine: Grandview, Coconino Co., Ariz. Employs 30 men. Wm. R. Page, president; H. H. Smith, secretary; John H. Page, treasurer and general manager; John Curran, mine superintendent. Organized 1902, under laws of Arizona, with capitalization $600,000, shares $10 par; unissued, $504,920. Lands, 10 claims, area 200 acres, also 10-acre millsite. Veins are contacts between limestone and porphyry, giving average assays of about 30% copper, from cuprite, melaconite, malachite, azurite and chalcopyrite. Property was discovered in 1892, and bought by present owners in 1902. Produced about 270,000 pounds of copper in 1903, from about 450 tons of ore smelted. Property is located in the Grand Canyon of Arizona, and is apparently of considerable promise.

CANYON GOLD & COPPER CO. **MONTANA.**

Office: Helena, Mont. Canol & Martin, managers; A. W. Martin, superintendent. Property is in the vicinity of Canyon Ferry, Lewis & Clarke county, Montana, and is a small shipper of smelting ore averaging about 22% copper, with fair gold values.

MINA CANZA. **PERU.**

Office and mine: care of A. Garland y Ca, owners, Canza, Ica, Peru. An old property and once a considerable producer. Numerous cupriferous veins in igneous rocks carry bodies of ore that are oxides and carbonates above and sulphides below the water level. Has 3 principal veins, opened to depth of 700′ on the Adelaide; 1,000′ on the Consolador and 500′ on the Tapadita, the latter having been the largest producer in the past.

CAP SHEAF COPPER & GOLD CO. **BRITISH COLUMBIA.**

Supposed to have copper prospects on Texada Island, British Columbia.

SOCIETE DELLE CAPANNE VECCHIE E POGGIO BINDO. **ITALY.**

Mine office: Massa Maritima, Grosseto, Italy. Property is sundry ancient mines, reopened in 1846, since which time they have been small but steady producers. Principal vein is 6″ to 50′ wide, ore being mainly chalcopyrite, which is sorted into two grades, the first grade of 11% average tenor being smelted, while the second grade, carrying about 3% copper only, is heap-roasted and leached.

CAPE COPPER CO., LTD. CAPE COLONY, NEWFOUNDLAND & NORWAY.

Offices: 9, Queen St. Place, London, E. C., Eng. Mine offices: O'okiep, Little Namaqualand, Cape Colony, and Tilt Cove, Newfoundland. Edmund A. Pontifex, chairman; John Taylor & Sons, managers; Compagnie Francaise de Mines d'Or et de l'Afrique de Sud, 20, Rue Taitbout, Paris, French agents; Percy John Frank, secretary; J. L. Dean, mine manager in South Africa. Capital, nominal, £750,000, in £150,000 of 6% cumulative £2 preference shares and £600,000 in £2 ordinary shares; issued, £690,000. Dividend payments in 1901 were £224,250; in 1902 there was a net loss of £6,494, and in 1903 a net profit of £95,979. Annual accounts are made up to April 30 at the Cape, and to Aug. 31 in London, and submitted in December. Separate accounts are kept for the Tilt Cove property in Newfoundland, which is held on a 99-year lease expiring 1989, at an annual rental of £4,400, plus one-half of net profits. The East mines of the Tilt Cove produce sulphide ores averaging 3% to 3.5% copper with small gold and silver values, while the West mines have much smaller ore bodies, averaging about 11% copper. Company is also interested in sundry Norwegian mines and is entitled to one-half of net profits of the Briton Ferry Chemical & Manure Co., Ltd., which takes the sulphurous gases given off by the smelters of the company's works at Briton Ferry, England. Principal mines of the company in South Africa are the O'okiep, Nababeep, Narrap and Spektakel. The O'okiep and Spektakel were opened in 1852, and the former remains the principal producer, while the Spektakel has been reopened recently. The Nababeep, opened circa 1890, produces about 7% ore. The Narrap is a comparatively new property. Ore is matted at the O'okiep smelter to a tenor of about 48% and shipped to England via Port Nolloth. The mine smelter is thoroughly modern in equipment, but lacks converters. The Namaqualand ore bodies are irregular massive deposits of copper and iron pyrites, associated with basic igneous intrusions in the granite and gneiss country rocks. At the Spektakel ore occurs in both the granitic and basic intrusive rocks, while at the Nababeep the ores are intimately mixed with the greenstone, appearing as bunches and veins in the richer portions only. Ore is mainly chalcopyrite, with some bornite and chalcocite, intimately associated with iron pyrites and showing occasional cuprite and melaconite, while a little malachite, azurite and chrysocolla occur near surface. This company is an old and important producer and is managed with great prudence.

CAPE BRETON COPPER CO., LTD. NOVA SCOTIA.

Office: 53 State St., Boston, Mass. Mine office: Coxheath, Cape Breton Co., N. S. Capitalization $2,000,000. John C. Watson, president; Isaac P. Gragg, secretary; J. Derr, treasurer. Property is the old Coxheath mine and adjoining lands, 10 miles from Sidney, Cape Breton, showing several cupriferous veins, of which the principal one, averaging 10' width, traverses felsite and diorite, carrying argentiferous and auriferous chalcopyrite in a silicious gangue, ore averaging about 1.5% copper.

CAPE D'OR COPPER DEVELOPMENT CO. **NOVA SCOTIA**

Mine office: Cape D'Or, Cumberland Co., N. S. Supposed to be doing a little development work, but no returns secured.

CAPILLITAS COPPER CO., LTD. **ARGENTINA**

Offices: 6, Princes St., London, E. C., Eng. Mine office: Pilciao, Catamarca, Argentina. Geo. Grindell-Milne, chairman; Noel Brown, vice-chairman; J. G. Tait, secretary; J. S. MacArthur, engineer; A. Stark, mine manager. Organized Nov. 25, 1901, with capital £500,000, in £150,000 cumulative 7% preference shares, £150,000 cumulative 7% ordinary shares and £200,000 deferred shares; issued, £254,975. Lands are extensive, including the Capillitas and Atajo groups of mines and the Pilciao and Constancia smelters bought for £95,000. Company also has sundry lands fairly timbered. The Capillitas group of about 20 properties, district of Andalgala in the eastern part of the province of Catamarca, shows 12 veins. Principal developments by the former owners were on the Restauradora, Rosalia, Carmelita, La Grande and Ortiz mines. These are being reopened by two tunnels under the old workings at La Grande, and by one new tunnel in the Restauradora. Ore from development work has averaged about 15% copper, with good gold and silver values. In four months ending October, 1903 these tunnels had been driven 475 metres. The ore is bunchy, as a rule, but very high in grade. The Atajo mines are about 30 miles from the Capillitas, and have a smelter with 6 small reverberatory furnaces.

These mines are much the most important in Argentina, and have been worked irregularly by local capital since about 1850. One of the principal difficulties in operation has been defective means of transport, as the mines are located in exceedingly rugged mountains, necessitating the shipment of ore to smelters by packmules. The mines are [illegible] above sea-level, and more than 6,000′ above the temporary smelters and shops at Pilciao. The nearest railroad station is Chumbicha, 165 kilometres distant over exceedingly rough and dusty roads. A traction engine was tried, but was a failure. The government has promised to extend the Cordoba Central railroad to Andalgala. To cover the worst stretch between the mines and smelter a single-rope aerial tram has been ordered. This will be 16½ miles in length, or about the same length as the aerial tram of the North American Copper Co. in Wyoming, now the longest in existence. The longest span is to be 2,700′, and in crossing one valley the cable will swing 625′ above the ground. The plant weighs 2,000 tons, and is made in sections for convenient packing on muleback. This tramway is designed to carry 40 tons of ore hourly, at a speed of 2.5 metres per second, cars being of 500 kilos capacity. The tram will leave a 20-mile gap between Pilciao and Muschaca, but the permanent smelter, with two 50-ton water jacket blast furnaces, is being erected at Muschaca Quebrada, where there is plenty of room and water. About 225 h. p. will be generated from the Rio Andalgala, and transmitted to the new smelter site electrically. The old Constancia smelters, with 2 reverberatory furnaces, have been overhauled, and in 1903 shipped 61 tons of matte averaging 62% copper, 60 oz. silver and 2 oz. gold per ton. Ores smelted by present company have averaged about 23% copper, 20 oz. silver and 15 dwts. gold per ton, but the grade will undoubtedly decrease with regular production. A considerable force is employed and development is along systematic and adequate lines. The property is being well handled and is one of great promise.

CARAHYBA COPPER MINING CO. **BRAZIL.**

Mine office: Alagoinhas, Bahia, Brazil.

CARBON COUNTY GOLD MINING & MILLING CO. **WYOMING.**

Mine office: Morgan, Carbon Co., Wyo. W. R. West, superintendent. Ores carry gold, silver, lead and copper. Has steam power and 10-stamp mill.

CARBONATE & LAURA MINES. **COLORADO.**

Mine office: Crystal, Gunnison Co., Colo. Hoffman Bros., owners. Have gold-silver ores, carrying a little copper. Water power.

CARDENAS COPPER CO. **ARIZONA.**

Absorbed by the Anita Consolidated Copper Company of Arizona.

CARDENILLO & EL ARMADILLO MINES. **MEXICO.**

Mine office: Tuxpan, Tepic, Mexico. Fernando Diaz, owner; A. C. Gonzales, manager. Produce silver-copper ores. Have steam power and employ 50 to 100 men.

CARIBOU GOLD & COPPER CO. **IDAHO.**

Office: care of Frank A. Putnam, Gray, Idaho. Organized September, 1903, with capitalization $2,500,000, shares $10 par, to develop claims 65 miles southeast of Idaho Falls, in Bingham county, Idaho. Said to have an 8′ vein, traceable 3,000′.

MINA CARIDAD. **SPAIN.**

Office: care of Don Carlos Lacone, agent, Seville, Spain. At last accounts fair-sized bodies of chalcopyrite and iron pyrites were being developed.

CARIDAD COPPER MINING CO., LTD. **SPAIN.**

Offices: 20-21, Lawrence Lane, London, E. C., Eng. Mine office: Campopio, Huelva, Spain. Robert Summerside Simpson, chairman; Geo. Thompson, secretary; R. T. Swallow, mine manager. Capital, nominal, £350,000. Lands include the Caridad group, in the province of Madrid, Spain, also sundry property in Huelva.

CARISA COPPER & GOLD MINING CO. **UTAH.**

Office: Salt Lake City, Utah. Mine office: Mammoth, Juab Co., Utah. J. E. Galagher, president; H. S. Joseph, vice-president and general manager; Geo. Norman, superintendent. Organized August, 1901, under laws of Utah, with capitalization $500,000, shares $1 par. Paid dividends of $30,000 in 1902. Lands, 7 patented claims, area 60 acres, in the Tintic district, showing 10 fissure veins in limestone, of which 3 are developed, these giving average returns of 12% copper, 5 oz. silver and $1 gold per ton. The Carisa shaft is 250′ deep and the Spy shaft 800′. Has tunnels of 800′ and 8,000′, with about 5 miles of underground openings. Has steam power and employs about 40 men, in addition to which portions of the mine are worked on lease. Production of refined copper in 1903 was about 660,000 lbs., and should be about 1,000,000 lbs. in 1904. Property is energetically managed and new ore bodies of considerable size and high grade are being developed on the company's account.

CARLISLE COPPER CO. **MONTANA.**

Organized as successor to the Butte-Anaconda Company, which did some development on the Carlisle mine in East Butte; letter addressed to company at Butte returned unclaimed.

CARMACK GOLD & COPPER MINING CO. **WASHINGTON.**

Office: Arcade Bldg., Seattle, Wash. Mine office: North Bend, King Co., Wash. Organized 1899, with capitalization $500,000, shares 25c. par. G. W. Carmack, president; L. O. Lane, secretary. Lands, 5 claims, on the south fork of Snoqualmie river, 22 miles northeast of North Bend. Has 375' of openings, showing veins of 12", 30" and 12', giving fair assay values in gold, silver, lead and copper.

MINA CARMEN. **CHILE.**

Mine office: Chañaral, Atacama, Chile. Simon Baldivieso, owner; Adriano Fernandez, manager. Has steam power and employs about 100 men.

CARMEN COPPER MINES, LTD. **CHILE.**

Offices: St. George's House, Eastcheap, London, E. C., Eng. Mine office: Cerro Blanco, Copiapo, Chile. Alfred Hambley Rowe, chairman; John Pye, secretary. Capital, nominal, £125,000; issued, £7,520. Property includes the Carmen Bajo mine, area 7 acres, with several smaller adjoining properties, and the Bella Vista group in the Copiapo district, also a small smelter. Company absorbed the Newfoundland Copper Co., Ltd., in 1901, thereby securing title to the Little Bay and Lady Pond copper mines in Newfoundland, now idle.

MINAS EL CARMEN AMPLICION. **MEXICO.**

Mine office: Cerralvo, Nuevo Leon, Mex. Marciano E. Villaneal, owner and manager. Ores are argentiferous copper and lead sulphides. Employ about 40 men.

CARN BREA & TINCROFT MINES, LTD. **ENGLAND.**

Office: Carn Brea, R. S. O., Cornwall, England. Frank Harvey, J. P., chairman; F. Forster Brown, consulting engineer; John Trevethan, secretary; W. T. White, mine manager. Capital, nominal, £150,000. Property is tin and copper mines at Redruth, Cornwall, formerly making nearly 1,000 tons of copper annually. Present production of copper about 30,000 lbs. yearly.

GEORGE E. CARNE Y OTRO. **CHILE.**

Own the Buena Vista mine, in the department of Tocapilla, Chile. Property opened 1880; idle at last accounts.

CARNEY MINING CO. **MICHIGAN.**

Said to have been organized November, 1903, by Norway, Michigan, men, to develop a copper prospect near Carney, Menominee county, Michigan. Letter returned unclaimed from Carney.

CAROLINA COPPER CO. **NORTH CAROLINA.**

Office: 839 Majestic Bldg., Detroit, Mich. Mine office: Cullowhee, Jackson Co., N. C. Organized October, 1901, under laws of Michigan, with capitalization $2,500,000, shares $25 par. Lewis C. Waldo, president and treasurer; Hugh M. McCormick, secretary and general manager. Lands, 1,000 acres, showing 4 veins, of which two, with average width of 27', are opened by a 55' shaft and a 120′ tunnel, showing sulphide ores assaying 3.25% copper, 4 oz. silver and $2 gold per ton. Property is old Wayehutta mine, opened 1854 and closed 1861, owing to outbreak of the American Civil War. Is now idle, but company plans resuming work in spring of 1904 and hopes to be producing 200 tons of ore daily by close of year.

CAROLINA GOLD & COPPER CO. **NORTH CAROLINA.**

Office: Salisbury, N. C. Mine office: New London, Stanley Co., N. C. Richard Eames, Jr., superintendent. Has a 5-stamp mill and works for gold only.

MINAS EL CARPIO. **SPAIN.**

Near Cortegana, Huelva, Spain. Area, 73 hectares. Have 11 old shafts. Ore, cupriferous pyrites. Property was under development by a French exploration company at last accounts.

CARR MINE & COLORADO CO., LTD. **COLORADO.**

Offices: 18, Leadenhall St., London, E. C., Eng. Mine office: Central City, Gilpin Co., Colo. Geo. Paget Walford, chairman; Walter J. Webb, secretary; Stephen Hosking, manager. Capital, nominal, £150,000. Ores carry gold, silver and copper. Has steam and electric power and a stamp mill.

MINAS DE CARRACEDO. **SPAIN.**

Office: Bilbao, Viscaya, Spain. Mines, in process of development, are in the province of Palencia, Spain.

CARRANZA-LAFONE COPPER MINING & SMELTING CORPORATION, LTD. **ARGENTINA.**

Offices: 86, Leadenhall St., London, E. C., Eng. E. Learoyd, secretary. Organized to secure mines, build a modern smelter and develop electric power in the Capillitas district, Rioja, Argentina.

CARRERAS HERMANOS. **BOLIVIA.**

Office and mine: Coro Coro, La Paz, Bolivia. Mine is opened on two successive strata of cupriferous conglomerates; see article on Bolivia for details. Production, about 400 tons of 75% copper mineral yearly. Only native copper is mined, and the product, as barillas de cobre, is shipped through Mollendo, Peru, for refining. Employs 150 to 200 men.

CARRIBEAN MINING CO. **COLORADO.**

Office: Holyoke, Mass. Mine office: Ophir, San Miguel Co., Colo. Chas. E. Newton, superintendent. Ores carry gold, silver, lead and copper. Has water power and a 20-stamp mill.

SOCIEDAD DE MINAS Y FUNDICIONES DE CARRIZAL. **CHILE.**

Offices: 1, Laurence Pountney Hill, London, E. C., Eng., and Catedral 2489, Santiago de Chile. Mine office: Carrizal, Atacama, Chile. Samuel Gonzales-Julio, chairman, and Thomas Izaga, vice-chairman, of Chilean board; H. Woodburn Kirby, chairman, and Herbert J. Page, secretary, of London board. L. Tiripagni, secretary, in Santiago; Wm. H. Martin, general manager. Organized June, 1898, under laws of Chile, with capital $2,100,000, shares $100 par, fully paid and issued. Dividends paid: 1898-99, 22¾%; 1899-1900, 14%; 1900-1901, 6.5%; 1901-1902, 6.5%; 1902-1903, 6.5%. Lands are in 4 groups, in various parts of the Carrizal district, province of

Atacama, Chile, and include the Chanarcitas mine, in the department of Freirina, opened in 1857, and making about 1800 tons of refined copper yearly; the Bronces, main shaft 408′, opened 1881, at Jarillas Transito, Vallenaro, Atacama; the Amarilla, main shaft 417′, opened 1867, at Cerro Blanco, Chanarcillo, Copiapo; the Astillas, main shaft 260′, opened 1878, in the Carrizal district, and the Armonia and Santa Margarita mines, of the famous Carrizal Alto group, at Carrizal Alto, Freirina, Atacama. Company has a 100-ton smelter at Chanarcitos. The ores are dressed up to 12 to 15% before taking to the smelter, and the product, a matte of 45% to 50% in tenor, is shipped to Wales for refining.

CARRIZAL SHARE TRUST, LTD. **CHILE.**

Address: 1, Laurence Pountney Hill, London, E. C., Eng. Owns stock in the Sociedad de Minas y Fundiciones de Carrizal.

CARRIZO MINE. **MEXICO.**

Office: care of Kent E. Keller & Co., owners, 711 Missouri Trust Bldg., St. Louis, Mo. A prospect, about 11 hours' horseback ride west of Autlan, Jalisco, Mexico.

CARTER COPPER CO. **VIRGINIA.**

Name changed in 1903 to Manassas-Gap Copper-Mines.

CASA GRANDE COPPER & GOLD MINING CO. **ARIZONA.**

Office: Chicago, Ill. Mine office: Casa Grande, Pinal Co., Ariz. H. E. Bagley, superintendent. Property is the Jack Rabbit mine, carrying gold and silver, with small copper values. Has steam power.

CASA GRANDE MINING & SMELTING CO. **ARIZONA.**

Office: 66 Broadway, New York. Mine office: Casa Grande, Pinal Co., Ariz. Organized June 14, 1902, under laws of Arizona, with capitalization $5,000,000. F. W. Pope, president; J. Douglass Taitt, secretary; H. H. Douglass, treasurer. Lands, 165 acres, 28 miles south of Casa Grande. Main shaft 150′. Claims to show 15,000 tons of 8% to 12% copper, which is probably an over-estimate. Company said to contemplate erection of a water-jacket smelter. Is a Douglass-Lacey promotion, and prospectus is filled with misleading statements.

CASCADE COPPER CO. **WASHINGTON.**

Said to be developing by tunnel on silver-lead ores, in Washington.

CASCADE COPPER MINING CO. **WYOMING.**

Office: 1246 Marquette Bldg., Chicago, Ill. Mine office: Encampment, Carbon Co., Wyo. Jas. Barrell, president; H. H. Rand, vice-president; Jas. Jay Smith, secretary and treasurer; Hiero B. Herr, general manager. Property is developing. Company declined to furnish statement for this work.

CASCADES COPPER CO. **WYOMING.**

Mine office: Encampment, Carbon Co., Wyo. Lands, 10 claims, including the Pasadena and High Five groups, opened by a 100′ shaft showing a 20′ vein, and a 700′ tunnel, cutting two smaller veins.

CASCADIA MINING & DEVELOPMENT CO. **WASHINGTON.**

Owns the Polar Star mine, on the north fork of the Toutle river, nea Black Falls, Wash. Has a small amount of development.

MINA DO CAVEIRA. PORTUGAL.

Mine office: Grandola, Portugal. Owned by Crookson & Hawkins. A new property in process of development, and not a producer at last accounts.

CEDAR FOREST GOLD & COPPER CO. ARIZONA.

Office: 534 Bradbury Bldg., Los Angeles, Cal. Mine office: Kingman, Mohave Co., Ariz. Organized August 27, 1903, under laws of Arizona, with capitalization $600,000, shares $1 par. Lands, 9 claims, area 180 acres, near headwaters of the Big Sandy river, stated in the advertisement of the company to be "the very best gold and copper district of Arizona," an important fact which has heretofore escaped notice. Lands are said to show a 25′ vein carrying gold and copper. Company advertises that its stock will draw 8% beside participating in the common dividend, which is a rather broad promise for a corporation that has no mill, and its mine to make.

CEDAR VALLEY GOLD & SILVER MINING CO. ARIZONA.

Mine office: Cedar Valley, Mohave Co., Ariz. Phillip P. Baker, superintendent. Lands include the Arnold, Silver Queen and other claims. Ores carry gold, silver and copper. Has steam power and a 15-stamp mill.

COMPANIA MINERA EL CEDRO. MEXICO.

Mine office: Guanajuato, Mexico. Vincente Gonzales, manager. Has steam power and is a producer of gold and copper, employing about 50 men.

CENTENNIAL MINE. COLORADO.

Office and mine: Georgetown, Clear Creek Co., Colo. David Kennedy, general manager; S. G. Evans, superintendent. Lands, about 1 square mile. Has cupriferous gold and silver ores in a 30″ paystreak opened in November, 1903, assaying up to 24% copper, 5 oz. to 150 oz. silver and 3 oz. to 5 oz. gold per ton. Has steam power and employs about 20 men.

CENTENNIAL COPPER MINING CO. MICHIGAN.

Office: 60 State St., Boston, Mass. Mine office: Calumet, Mich. Company was reorganized with present title in 1896, under laws of Michigan, with capitalization $2,500,000, shares $25 par; issued, $2,250,000. Annual meetings are in April. H. F. Fay, president; Geo. G. Endicott, secretary and treasurer; H. F. Fay, John C. Watson, Wm. Howell Read, Stephen R. Dow, Geo. G. Endicott and James Chynoweth, directors; James Chynoweth, superintendent; John Pentecost, mining captain. An assessment of $4 per share was levied Jan. 25, 1904, payable in equal installments, Feb. 12 and July 12, 1904.

Official returns to the state of Michigan, as to date Jan. 1, 1903, disclose the following figures·

Amount cash paid in on capital stock	$1,150,000.00
Entire amount invested in real estate	249,457.01
Amount of personal estate	258,082.17
Production of copper, 1902, lbs.	74,667

Lands, 660 acres, being Section 12, Town 56 North, Range 33 West, and a triangular patch of about 20 acres at the southeastern corner of the main tract, bought to secure the outcrop of the Kearsarge lode. The first development work was done in 1863, by the Schoolcraft Mining Co., but that company failed to open a paying mine, and the company was reorganized in 1876 as the Centennial Mining Co., and again reorganized in 1896 with the present title. Expenditures of upwards of $1,500,000 were made in unsuccessful efforts to open a paying mine on the northern extension of the Calumet conglomerate. Seven shafts were sunk on this bed, three being of considerable depth, No. 3, the deepest, being bottomed at 3,200′. Work on this lode was sufficiently extended to fully demonstrate the worthlessness of the Calumet conglomerate on Centennial property. The Centennial lands are in the great mining camp of Calumet, and are available for building purposes. Two additions have been platted and the lots sold at good prices. Only surface rights are sold, mineral being reserved by the company. The present management abandoned the conglomerate shafts in 1897, after a few months' efforts, and deepened two shallow shafts on the Osceola lode. These are 7x12′ inside of timbers, sunk at angle of 38° and are 1,050′ and 1,150′ in depth respectively. Upon securing the 20-acre tract carrying the outcrop of the Kearsarge lode, which underlies the Centennial's entire square mile of territory, the work of development was begun in September, 1899. Owing to the narrow width of the tract secured from the Osceola company, it was necessary to develop in a peculiar manner, by two shafts, "A" and "B," which are but 90′ apart at surface, and continue parallel on the dip of the lode until the 13th level, when the Centennial's main tract is reached, after which "B" shaft diverges from "A" at an angle of 15° on the plane of the lode, 300′ being taken by a curve to secure the divergence of 15°. This plan of opening gives short drifts until the shafts enter the main Centennial tract, after which length is gained rapidly with depth. At the close of 1903 "A" shaft was 2,825′ in depth, with drifts of more than 800′ on either side upon the 25th level. Each shaft is 7x18′ inside of timbers, witth three compartments, and sunk at an angle of 39° with the horizon. The overburden is about 100′ and the amygdaloid averages 15′ to 18′ in width. Fair copper values were obtained in the first few levels, after which a comparatively barren zone was penetrated until the 14th level was reached, after which came gradual improvement. The 25th and levels below show excellent copper ground, with many fine stopes. The upper levels of "A" shaft, partially caved in by surface seepage, have been completely retimbered and the mine now has nearly four miles of underground openings. "B" shaft is 1,400′ in depth, and within 90′ of surface. This is to be holed through to surface and deepened at once. Owing to the close proximity of the shafts a single shaft-rockhouse suffices. The old rockhouse was replaced in 1903 by a new frame structure, sheathed with corrugated iron and having rock bins of 3,000 tons capacity, this being the largest capacity had by any shaft-rockhouse in the district. The boiler house is 54x58′ with four 125-h. p. Burt locomotive-firebox boilers. The stone compressor house is 32x46′, with a 35-drill air compressor and has a Dean jet condenser in the basement. A 16x46′ frame pumphouse with iron roof has a fire-pump, hose and hose carts. The miners' changing house, 25x50′, of wood, has hot and cold water and lockers. The stone engine-house is 50x70′ and has a 32x72″ Nordberg hoist good for a depth of 6,000′. The mine also has well fitted machine, blacksmith and carpenter shops standing in a row, office building, warehouse, barns and a number of good dwellings. There are also auxiliary air compressors of 10, 12 and 15-drill capacity and the surface plant and buildings are conveniently arranged for economical work. The Mineral Range railroad reaches the old shafts and is connected with shafts "A" and "B" by a private line, while the Copper Range railroad reaches the new shafts direct.

The old stamp mill at the mine, with about 225 tons daily capacity, has a single head, 21 jigs and 2 slime-tables. This was closed in February, 1902, and is too antiquated for further use. The Centennial company owns a fine millsite on Torch Lake opposite the Calumet & Hecla mills, and is negotiating for the lease or purchase, probably the latter, of the Arcadian mill at Grosse Pointe. This mill is a modern structure with three heads and a thoroughly good equipment, but has bad foundations, which should be completely rebuilt before its use is attempted. It was the plan of the Centennial management in 1902 to construct a stamp mill with the proceeds of a $5 assessment levied, but owing to an unfavorable change in the nature of the lode this plan was held in abeyance, and the extensive underground work since done has consumed the company's cash resources. While the new mill was not built according to program, it is far better that this was not done. Had a mill started one or two years ago with the limited amount of underground openings then available, and with the average of rock so low in grade as was then the case, nothing but disaster could have followed. This the management wisely perceived, and is rewarded for its patience and persistence by a mine at depth that compares favorably with the average of the shafts opened on the Kearsarge lode, upon which are developed such magnificent producers as the Wolverine, Mohawk, and the North and South Kearsarge mines of the Osceola. The affairs of the Centennial company are on a sounder basis than ever before, and the prospects of the property were never so bright as at the beginning of 1904.

CENTENNIAL-BINGHAM MINE. UTAH.

Letter returned unclaimed from Bingham Canyon, Salt Lake Co., Utah. Property has cupriferous lead ores and plumbiferous copper ores carrying about 3.5% copper, both slightly auriferous and argentiferous.

CENTENNIAL-EUREKA MINING CO. UTAH.

Offices: 4, Postoffice Sq., Boston, Mass., and 508 Dooly Bldg., Salt Lake City, Utah. Mine office: Eureka, Juab Co., Utah. Practically entire stock issue is held by United States Mining Co. R. D. Evans, president; F. W. Batchelder, secretary and treasurer; A. F. Holden, managing director; C. E. Allen, superintendent. Organized 1876, under laws of Utah, with capitalization $5,000,000, shares $25 par; issued, $2,500,000. Has paid dividends of more than $2,500,000. Ores carry silver, gold, copper and lead. Has steam power and concentrator, employing 150 to 200 men.

CENTRAL GOLD & COPPER CO. NEW MEXICO.

Mine office: Mineral Hill, Donna Ana Co., New Mexico.

CENTRAL MINING CO. MICHIGAN.

Office: 11 William St., New York, N. Y. Joseph E. Gay, president;

J. Wheeler Hardley, vice-president; John Stanton, secretary and treasurer; F. McM. Stanton, agent. Mine, in Keweenaw county, Michigan, was opened 1854, on a fissure vein, and closed down 1898, after paying dividends of $1,970,000. Diamond drill borings giving a complete cross-section of the extensive lands of the company show 3 amygdaloidal beds carrying a little copper. An experimental plant, built to rework the extensive tailings of the old mill, did not prove commercially successful, and has been abandoned.

CENTRAL ARIZONA MINE. **ARIZONA.**

Mine office: Williams, Coconino Co., Ariz. Rounseville & Hardesty, owners; E. M. Hardesty, superintendent. Ores carry gold, silver and copper. Has gasoline power.

CENTRAL BLACK HILLS COPPER CO. **SOUTH DAKOTA.**

Office: 701 New England Bldg., Cleveland, Ohio. Mine Office: Custer, Custer Co., S. D. E. M. Barnes, president and general manager; L. M. Chartrain, secretary; R. M. Fuller, general superintendent. Organized July, 1902, under laws of South Dakota, with capitalization $1,500,000, shares $1 par. Lands, 30 claims, area 600 acres, also a 40-acre millsite and miscellaneous lands giving a total area of 720 acres, in the Pennington district, showing sundry veins, of which two of 18′ average width, opened by shafts of 85′ and 110′ and tunnels of 42′ and 225′, are contacts between slate and quartzite, giving average assays of 6% copper, 2 oz. silver and $4 to $200 gold per ton, from azurite, malachite and chalcopyrite. Has a 200-h. p. steam plant and power drills, with a concentrator having 2 crushers and 4 jigs. Has a 100-ton leaching plant, completed December, 1902, and planned to turn out product as cement copper. Also has a sawmill. Purposes driving tunnel on ledge about 1,200′ and installing a 6-drill air compressor in 1904. Company's officials are men of good standing and the property shows large bodies of low-grade ore that gives promise of successful treatment by lixiviation.

CENTRAL CHILE COPPER CO., LTD. **CHILE.**

Offices: 15, Angels Court, London, E. C., Eng. Mine office: Panulcillo, Ovalle, Coquimbo, Chile. Eugene A. J. Goldschmid, chairman; Henry B. Greenwood, secretary; Michael Scantlebury, mine manager. Registered Jan. 11, 1898, as a second reconstruction of the Panulcillo Copper Co., Ltd., with capital, nominal, £300,000; issued, £276,248; debentures, £23,752, at 4%. This company and its predecessors have worked the Panulcillo mines since 1894. Group includes the Panulcillo and San Gregorio, at Panulcillo, and the Inagotable, Cocinera and Condesa mines at Huamalota Sataqui, Ovalle. The mines are all small, except the Panulcillo, which has a 120-ton smelter, employing about 650 men and producing about 1,600 tons of refined copper yearly, partly from custom ores. Shareholders of the company are dissatisfied with the present management, which seems inclined to carry matters with a high hand, and the company's present conditions and future prospects do not seem overly assuring.

CENTRE STAR MINING CO. **BRITISH COLUMBIA.**

Mine office: Rossland, B. C. For year ending September 30, 1903, made net earnings of $265,000, of which the sum of $195,000 was applied in liquidating previous indebtedness. Mining costs were only $1.97 per ton, a low record for the Rossland district. Property is installing an Elmore oil concentration plant, jointly with the War Eagle mine, and begins 1904 with much the best prospects in the mine's history.

CENTURY MINE. ONTARIO.

Office: care of Foster & Black, Sudbury, Ont. Location, Graham Twp., Algoma, Ont. Assays give 7% to 13% copper, and from a trace to $26 gold per ton.

CERESIER MINE. FRANCE.

Was the principal copper producer of France, when working, but has been idle for some years.

CERMA DEVELOPMENT CO. ARIZONA.

Office: Calumet, Mich. Organized, 1903, to develop a group of 47 claims in the Huachuca Mountains, Cochise county, Arizona.

CERRO COPPER CO., LTD. PERU.

Offices: 1, Laurence Pountney Hill, London, E. C., Eng. Wm. Henry Watts, chairman; Herbert J. Page, secretary. Capital, nominal, £101,000. Organized to acquire claims in the Cerro de Pasco district of Peru.

CERRO MURIANO MINES, LTD. SPAIN.

Offices: 6, Queen St. Place, London, E. C., Eng. Mine office: Manriques 9, Cordoba, Andalusia, Spain. Employs 100 to 150 men. Wm. Frecheville, chairman; John Taylor & Sons, managers; F. H. Williams, secretary; Richard E. Carr, British vice-consul at Cordoba, superintendent; Joseph Tamblyn, mine superintendent. Organized May, 1903, with capital, nominal, £125,000, shares £1 par, 5s. paid. Lands, 314 claims, freehold, area 776 acres, 10 miles northeast of Cordoba. Mines were worked to depth of at least 400′ during the Roman era, notwithstanding their wetness. Property shows 6 large and several small fissure veins in micaceous schists, diorite and quartzite, carrying chalcopyrite and iron pyrites, with a gangue of calcite, quartz, clay and country rock. Veins have widths of 1′ to 40′, with following lengths: Calavera, 1,635′; Excelsior, 635′; Lorenzo, 4,575′; Isabel, 5,550′; Cerro Muriano, 8,500′. Ore taken from old Roman workings have assayed 28% to 34% copper. Main shafts are 300 metres apart, the Santa Victoria having 646′ depth and San Rafael 574′, former shaft cutting the vein at 130 metres and 160 metres, ultimately passing through the vein, still in old workings, at 177 to 195 metres. The San Rafael has crosscuts at depth of 100, 132 and 154 metres, each level showing a vein of 5 to 13 metres width, better portions worked out by the Romans. The San Rafael shaft is being enlarged and is being made the main pumping shaft, to have a new plant, now building in England. Has a 1,000-h. p. steam plant, with 2 hoists and a 5-drill Walker air compressor. This is one of the largest and most interesting of the old Hispano-Roman mines, and was famous before the Christian era for the high quality of copper and brass produced from its ores, but was entirely idle for some 2,000 years until reopened by the present owners.

SOCIEDAD CERRO DE PASCO. PERU.

Supposed to be the Peruvian title of the Cerro de Pasco Mining Co.

CERRO DE PASCO MINING CO. **PERU.**

Office: 203 Aldrich Court Bldg., New York. Peruvian general office: Lima, Peru. Mine office: Cerro de Pasco, Peru. Organized June 6, 1902, under laws of New Jersey, with capitalization $10,000,000. Control supposed to be owned by Jas. B. Haggin, H. McK. Twombley and others, of New York. Alfred W. McCune, general manager, Lima, Peru; A. E. Welby, superintendent of railroad, Oroya, Peru; Jas. MacFarlane, superintendent of mines, Cerro de Pasco, Peru; Frank Klepetko, consulting engineer, New York; E. H. Repath, assistant consulting engineer; W. F. Blackford, chief engineer. Lands, about one square mile, comprising about three-fourths of the rich Cerro de Pasco district, said to have been acquired at a cost of about $2,650,000. Tract is in a compact body, the surface showing many tajos, caves remaining from ancient open-cast workings. The lands lie in a basin, hence tunnelling is difficult, the only important opening of this sort being the Rumiallana tunnel. The company also owns extensive coal lands, north of the copper mines, the coal being bituminous and coking well. The Cerro de Pasco district is 200 miles from Callao, the nearest seaport. Preliminary work was carried on by the South American Development Co., previous to organization of the present company. Silver was discovered at Cerro de Pasco in 1630, and the production of the district to the close of the Nineteenth Century is estimated at 450,000,000 ounces, secured from about 40,000,000 tons of silver and copper ore, nearly all extracted by hand labor and carried 3 to 6 miles on the backs of llamas to primitive smelters, from which the silver bullion was transported by llama 200 miles to Lima, until circa 1870, when the railroad was completed to Oroya.

The Cerro de Pasco district is located 14,300′ above sea-level, rendering physical labor very fatiguing. The population of the town is variously estimated at 5,000 to 12,000. The surrounding country is bleak, and all food and supplies must be brought in from considerable distances. The year is divided into two periods, the wet and dry, the wet season being from November to April. The summers are not hot, owing to the great elevation, and the winters are not cold, owing to the low latitude. Snow and hail fall at any time, summer or winter, but rarely remain as long as 48 hours, even in winter. The fluctuation between average summer and winter temperature is about 20° Fahrenheit, only.

Authorities disagree hopelessly as to the geology of the district. All that can be said with certainty is that in an area approximately one mile wide and between one and two miles in length there is ore on nearly every claim, proving the Cerro de Pasco one of the richest mineral deposits of the globe. The ores carry gold, silver, copper, cobalt and other metals, values being found in two zones, the upper carrying mainly silver, in quantities from a few ounces to thousands of ounces per ton, in decomposed quartz. Considerable gold is found in the upper zone, this running as high as 1 to 2 oz. per ton, occurring in rich but erratic chutes. The silver values usually extend to a depth of about 100′, followed by silver-copper ores and at a little lower depth copper-silver ores. All of the copper-ores are more or less argentiferous being estimated to average 15 to 35 oz. of silver per ton, and practically all of the copper ore is bismuthiferous also, hence highly refractory in reduction. In the past only the richest copper ores have been worked, those shipped ranging from 25% to 40% in tenor. Claims advanced that the ores of the district will average 25% copper are entirely unwarranted, as the high-grade ore shipped was carefully hand-selected, owing to excessive transportation charges. However, the Cerro de Pasco is one of the world's largest and richest copper deposits, without question. The copper ores grow leaner with depth, as in other districts, and values below the permanent water level at about 250′ seem somewhat uncertain, though indications favor the existence of large and permanent sulphide ore bodies of good grade. In but few cases have any of the old mines been opened to depth of more than 200′, while the great majority are less than 100′ in depth. The company is sinking 5 two-compartment shafts which had reached depths of 150′ to 300′ in September, 1903, two of the shafts having passed the water-level and begun pumping. There are three drainage tunnels in the district, the only one of importance being the Rumiallana, begun by Henry Meiggs in 1887 and discontinued at a distance of 1,000′ because of his death. Meiggs held a concession from the Peruvian government for 25% of the gross values extracted by mines drained through this tunnel. This concession is now held by a Peruvian company, which has cleaned out the old heading and driven the tunnel to length of 1,466′. There is a possibility of litigation between the Cerro de Pasco and this local corporation in case the latter completes the tunnel. The ore in sight in the district was estimated at 5,000,000 to 6,000,000 tons in 1899.

The Cerro de Pasco company bought the remaining machinery and supplies of the Arcadian mine in 1903, filling 30 cars with hoists, air compressors, boilers, drills, pumps and crushers, with complete machine shop and boiler shop plants, and a considerable quantity of steel, pipe and general mining supplies.

There are a few small copper matting furnaces, with a daily capacity of perhaps 250 tons, in the Cerro de Pasco district. The company's new smelter is located 9 miles south of the mine, on the main railroad line, and is being erected under contract by M. P. Connell. The smelter is to be of 1,000 tons daily capacity, equipped with two blowing engines for the converters, each capable of compressing 24,000 feet cubic of free air per minute to a pressure of 17 lbs. per inch, and to be operated by 1,500-h. p. Nordberg engines, also five 350-h. p. blast furnace blowing-engines with capacity to compress 30,000 cubic feet of free air to a pressure of 2.5 lbs. per inch. For general power purposes there will be two 475-h. p. Nordberg engines, direct-connected with 350-kw. generators. The furnaces and much of the machinery will be supplied by the Allis-Chalmers company.

The mine is served by the Cerro de Pasco railway, building by the company under a government concession. This line runs about 80 miles from Cerro de Pasco southward to Oroya, and is to be extended northward to the company's coal mines. Including the main line, spurs and sidings, it will have about 125 miles of track. The company is also said to have under consideration the extension of this line past the coal mines, through a very rugged country said to be rich in copper and silver. The line will have an average grade of 1.5%, with a maximum grade of 3% and will cost upwards of $2,000,000. At Oroya connection is made with the Central Railway of Peru, running 130 miles to Callao. In this distance the railroad, which cost $43,000,000, gains nearly 3 miles vertical elevation, reaching the highest altitude of any railroad on the globe, and the engineering difficulties surmounted are comprehensible only to those who have travelled over the line.

Wages are 25c. to 50c. per day for natives and $2.50 to $4 per day for white labor. Peru is on a gold basis.

Owing to the great distance of this property from other copper centers, its magnitude and promise have been somewhat exaggerated, and many misleading articles have appeared in print, these being, however, in no wise ascribable to the management, which has no stock for sale and does not court publicity. The Cerro de Pasco property is one of great size and exceptional promise, but there are many and serious obstacles in the way of making it a large and successful mine. Some of these difficulties have been overcome, while others are in process of elimination, and the balance will probably be conquered in the future, as the company has great financial strength and its principal shareholders are men of long and successful experience in mining. The actual work in all departments is in the hands of thoroughly competent and experienced men.

CERRO DE PASCO TUNNEL & MINING CO. **PERU.**

Office: 35 Wall St., New York. Organized under laws of Maine, with capitalization $12,000,000, half in 7% cumulative preference shares of $10 and half in $10 common shares. As near as can be learned company has an option for the purchase of the Rumiallana or Meiggs drainage tunnel, in the Cerro de Pasco district, and holds 50 claims, area about 250 acres, 37 miles from Lomas, in the Acari district of Peru.

CERRO VERDE MINE. **MEXICO.**

Mine office: San Javier, Sonora, Mex. C. C. Rountree, owner; W. M. Kiddie, superintendent. Is developing by shaft and tunnel.

SUCESION CERVERO. **CHILE.**

Office and mine: Petorca, Aconcagua, Chile. Operates the Cabildo mine, opened 1886, producing the equivalent of 800 tons refined copper yearly, shipped as matte. Also owns the following old mines at Nipa and Coligue; Montoya, opened 1855, developed by 900′ tunnel; Castillo, opened by 400′ shaft; Quisco, opened by 300′ shaft, and Cuevas, opened by 120′ shaft. Employs about 250 men.

CETINI MINE. **ITALY.**

Near Pisa, in the Volterrano district of Italy. This is a new mine with occurrence and nature of ore similar to the Montecatini, and is a small producer of copper.

CHALCHIHUITES MINES CO. **MEXICO.**

Office: 288 Garside St., Newark, N. J. Mine office: Chalchihuites, Zacatecas, Mexico. Edw. H. Jones, president; C. C. Hamer, secretary; B. W.

Farris, general manager. Lands, 192 pertenencias, including the San Nicolas mine, carrying ores of gold, silver, copper and lead. Is opened by shaft, equipped with steam power and employs about 40 men.

CHAMPION COPPER CO. **MICHIGAN.**

Office: 27 State St., Boston, Mass. Mine office: Painesdale, Houghton Co., Mich. A new, but large and highly promising producer. Organized under laws of Michigan, December, 1899, with capitalization $2,500,000, shares $25 par. Entire stock issue is owned jointly by Copper Range Consolidated Co. and St. Mary's Mineral Land Co. Wm. A. Paine, president; Arthur G. Stanwood, vice-president; Frederic Stanwood, secretary and treasurer; Wm. A. Paine, Samuel L. Smith, Chas. H. Paine, Arthur G. Stanwood, J. Malcolm Forbes, Geo. P. Gardner and Richard Olney, directors; Dr. Lucius L. Hubbard, general manager; R. R. Seeber, engineer; John Broan, mining captain; M. J. Harrington, clerk; F. G. Coggin, mill superintendent; R. H. Leach, assistant mill superintendent; John Mackay, superintendent of motive power.

Official returns to the state of Michigan, as of date Jan. 1, 1903, disclose the following figures:

Amount cash paid in on capital stock	$1,475,000.00
Amount paid in by conveyance of property to company	1,025,000.00
Entire amount invested in real estate	1,025,500.00
Amount of personal estate	1,311,438.88
Amount of unsecured or floating debt	275,228.81
Amount due corporation	8,242.25
Production of copper, 1902	4,544,504 lbs.

Lands, 1,240 acres, consisting of the south half of Section 30; west half and north half of northeast quarter and southwest quarter of northeast quarter of Section 31, Town 54 North, Range 34 West; southeast quarter of Section 25 and east half of Section 36, Town 54 North, Range 35 West, practically all on the mineral belt. Neighbors of the Champion are the Copper Range and Trimountain on the north; lands of St. Mary's company and Hussey, Howe & Co. on the east; Hussey-Howe lands and the Globe property on the south, and the Copper Range tract on the west. The tract gives a distance of 8,960′ on the strike of the lode, and at the present angle of dip the deepest shaft can go down 18,950′ before reaching the company's boundary line on the west.

Development was begun in the spring of 1899, under direction of Dr. Hubbard, whose work was crowned by immediate success. Three parallel amygdaloids were uncovered by trenching across the formation, one of these, the Baltic lode, showing phenomenal copper values. Ten test-pits sunk at intervals on this lode were bottomed in the same rich rock, and the two amygdaloids paralleling the Baltic lode show copper in sufficient quantities to render their exploration advisable at some future time. A fourth amygdaloid, about 15′ wide, was discovered east of the Baltic lode in 1901, this carrying heavy copper to a promising extent. There is also a fissure vein of arsenical ore, apparently algodonite, near "C" shaft. The width of this vein at surface is slight, and mineral contents variable, but on the second level the fissure is 2′ wide and well mineralized.

The dip of the Baltic lode at Champion is about 70°, with about the same strike as at the Trimountain, rather than the exaggerated easterly trend noted at the Baltic mine. The bed runs 13′ to 45′ in width and averages 24′ width, carrying more epidote than at the Trimountain and Baltic. The surface of the tract is very hilly, but the overburden is less than is found either to the northward or southward. The stretches of lean ground in the mine are few, and the lode carries heavy copper in profusion, mostly in barrel size, but running up to masses of 10 tons in weight. The mine had nearly six miles of underground openings at the close of 1903, of which about 6,500′ were made in 1903. Only about 15% of the rock broken is discarded, and the rock milled returns about 30 pounds of refined copper per ton.

The Champion has four shafts, numbered from north to south, with room for four more. Locations of these shafts and depths on Jan. 1, 1904, were as follows: "B" shaft, the northernmost, is 1,835′ south of the Trimountain line, with collar 635′ above mean water datum of Lake Superior and is 910′ deep; "C" shaft is 1,050′ south of "B," 616′ above the lake and 886′ deep; "D" shaft is 1,300′ next south, 621′ above the lake and 1,006′ deep; "E" shaft is 1,300′ next south, 3,900′ north of the boundary line of the Globe tract, and is 1,104′ deep. All four shafts are connected on the upper levels, with other connections driving. The lode has so little poor ground that in all likelihood every drift will be driven from end to end of the mine, giving the longest average levels ever opened in any Lake Superior property, if not in the world. The only poor showing made in the mine was at "E" shaft, where the ground was disturbed and carried little copper on the second and third levels, but became quite regular and well mineralized on and below the fourth level. The mine has some stopes that are phenomenal for width and richness, probably carrying as much copper per running foot as the best average stopes of the Calumet & Hecla.

The shafts have duplicate combination shaft-rockhouses, 40x50′ on the ground, each with steam hammer for heavy copper, one 12x15″ and two 18x24″ crushers, engines and storage bins, except that "D" shaft has three of the largest size crushers. Each shaft has a hoist good for 1,500′ depth.

The principal mine buildings are of steel and sandstone. The machine shop, 60x144′, of sandstone with slate roof, has a traveling crane and trolley rail for its entire length and is equipped with a complete line of shop tools, power being supplied by a 30-h. p. electric motor. Standing beside the machine shop, and also of red sandstone, is the 50x128′ smithy, which has a trolley rail running the entire length of the shop for handling forgings. Both machine shop and smithy have heating plants and railroad tracks connecting with the Copper Range road. The carpenter shop, of wood with iron roof and siding, is 32x60′ in size.

The principal mine buildings are located about a quarter mile south of "E" shaft in the ravine across from the point where "F" shaft was started, but abandoned because of treacherous overburden. The ravine has been dammed and impounds 12,000,000 gallons of water for boilers and the protection of mine buildings and townsite against fire. The dam is 30′ high from hardpan to crest, with a 5′ cement core at bottom tapering to 2′ at the top, and reinforced by rock. Near "B" shaft there is a 40-drill Ingersoll-Sergeant cross-compound two-stage air compressor with vertical receiver intercooler. The new steel compressor building is at "F" shaft, and is to house a 100-drill Nordberg compressor, contracted for delivery March, 1901, but actually delivered nearly 3 years later. The compressor has quadruple expansion cylinders, the high-pressure cylinder taking steam at an initial pressure of 300 pounds per inch. Three 250-h. p. Geary boilers contracted for delivery in 1902 will also be installed early in 1904. The electric plant is located in the compressor building. The installation of underground electric haulage is being given consideration, the Champion being peculiarly adapted to this form of traction because of the regularity and exceptional length of its levels. A coal bunker at "F" shaft has railroad tracks on trestles with a tunnel below each, coal falling through hatches into cars in the tunnels which lead into the boiler-house. The entire plant at "F" shaft is exceptionally well designed in a way to save all unnecessary labor.

The company owns a good office building, two miners' changing houses, warehouses, stables, three large boarding houses and 244 substantial dwellings. The townsite, an unusually attractive one for a mining camp, is called Painesdale, and in addition to the company's buildings has a hotel, schoolhouse and several business houses. The Sarah Sargeant Paine memorial library, a handsome red sandstone structure costing $30,000, was erected by Wm. A. Paine, president of the company, as a memorial to his mother. A complete water system with reservoir, mains and hydrants is to be installed for the joint benefit of the mine and town. This will have a pumping station at Lake Perrault, with a 200,000-gallon steel storage tank on high ground near Painesdale. The town and mine are served by the Painesdale branch of the Copper Range railroad.

The stampmill is at Freda, on Lake Superior, about two miles west of Redridge. The mill is 178x215′ in size, of steel and concrete, built by the Wisconsin Bridge & Iron Co., and has 4 Nordberg stamps. The first three heads went into commission early in 1903, and the fourth head was completed in June, 1903, but cannot go into commission until the installation of the new air compressor at the mine gives power to break more rock. Each head has a 15′ concrete foundation and the washrooms have cement floors. The mill has 40 Overstrom concentrating tables, and Hodge graduated adjustable-speed jigs having plungers to work simultaneously or alternately in pairs. All heads were compounded in June, 1903, being the first stamps to which the principle was applied. The results have been most satisfactory, as during the summer months of 1903 the heads crushed 42 tons of rock for each ton of coal burned—a new low record for the district. Regrinding of raggings is done by Allis-Chalmers crushing rolls, having one roll in a fixed bearing and one with a spring adjustment.

The mill is heated by hot water from a Green fuel economizer, piped at

300° to 350° Fahrenheit to a steel-clad chamber, whence heated air is drawn into ducts by a blower and distributed through the mills, the water being pumped back to the economizers and thence fed to the boilers. The steel boiler-house has five 250-h. p. Springfield boilers of Scotch type, with room for five more, and is supplied with a Green fuel economizer, Detroit automatic stoker and Sturtevant blower. Coal is brought to the boilers by a gravity tram and reduced to uniform size by a grinder before fed to the grates by the automatic stoker, while ashes are washed into the lake through a launder by jets of water. Exhaust steam passes through dry condensers, thence to a hot-well, from which water is fed into the boilers at a high temperature.

The 40x60′ steel pumphouse, with truss roof and traveling crane, houses a 20,000,000-gallon triple expansion Nordberg pump. Water for the mill and boilers comes from Lake Superior through a tunnel 1,020′ long, the shore end having a well with bottom 8′ lower than the lake level, this being the longest tunnel ever driven under Lake Superior. The intake crib has a free area of 45 square feet, and with a second crib the tunnel could furnish water for 8 to 10 stamps. The water cost was about one and one-half cents per ton of rock stamped in 1903, somewhat under the average cost in the district. The tailings from the mill average about 0.25% copper only. The mill has a private telephone system, machine, carpenter and blacksmith shops, warehouses, fire-pump and water mains with 5 hydrants. There are about 20 dwellings for employes at the millsite. A two-head addition to the stampmill is to be built on the eastern side of the structure, and the new stamps will be numbered 1 and 2.

The Champion began production Jan. 10, 1902, with one leased stamp at the Atlantic mill, and a second leased head was put in use during the following August, the Champion's own mill going into commission early in 1903. The prediction of returns of 30 to 35 pounds of refined copper per ton of rock stamped have been verified by the 1903 returns of 30 to 32 pounds per ton, including the stamping of considerable low-grade stuff stocked at the shafts. The three heads in use at the mill are crushing an average of about 1,400 tons daily, of which upwards of 75% comes from development work, this rock carrying considerable heavy copper. The mine is running 56 air drills, and there are stopes opened for twice as many, but the power is lacking to run them, pending the installation of the new air compressor, which should go into commission about May or June, 1904. The production of refined copper in 1902 was 4,165,784 lbs., from 121,478 tons of rock stamped, an average of 34.29 lbs. per ton, and in 1903 the production was about 12,750,000 lbs., from approximately 400,000 tons stamped. By the close of 1904 the mine should be producing to the mill's fullest capacity, and when the two new stamps are installed the property should make about 25,000,000 lbs. of refined copper yearly, placing the Champion, which is the best of the new mines of Lake Superior, second only to the Calumet & Hecla in production.

The Champion Copper Co. entered the list of dividend payers in 1903, declaring three dividends of one dollar each, on Apr. 21, June 29 and Oct. 16, 1903, giving total dividend disbursements of $300,000 in the second year production and the first year of production with its own mill. The Champi is a magnificent mine and it has a management in keeping, fully capable giving the property every opportunity of expanding as its merits warrant.

CHAMPION GOLD & COPPER MINING CO.

Office: California Blk., Tacoma, Wash.

CHAMPLAIN MINING CO. IDAH

Had claims near Doniphan, Blaine Co., Idaho, with L. C. Bailey, supe intendent, at last accounts. Three letters to this address were returned u claimed, but the postmaster at Doniphan wrote that the "mines" in th vicinity closed down during the winter.

MINA LA CHAPARRITA. SPAI

Mine office: Nerva, Huelva, Spain. A group of 11 old mine openin area 106 hectares. A little copper is produced by cementation from the mi waters.

CHARLOTTE & CONSTANCE MINES. NEW CALEDONI

Mine office: Bonde, New Caledonia. These properties show large o crops and have been described by the French authorities as mountains ore, but it cannot be learned that any serious attempts at developments ha ever been made.

CHARM & COPPERHEAD GROUPS. UTA

In the Drum Mountain district of Utah, sometimes known as the Bus & Clive properties The Charm group is said to have considerable ore block out and to carry good values in copper and gold.

CHARTER OAK COPPER MINES, LTD. BRITISH COLUMBIA & WYOMIN

Offices: 16, Victoria St., London, S. W., Eng. Mine office: Sarato Carbon Co., Wyo. Sir H. Seton-Karr, M. P., chairman; T. Toten Willco secretary; J. B. Hassett, mine manager. Capital, nominal, £40,000; issue £28,957. Lands include two properties in British Columbia, also 84 acr and 5-acre millsite in the Upper Platte district of Carbon Co., Wyo., latt showing 2 fissure veins averaging 12′ wide, and carrying oxide and sulphid ores giving assays of 4.5% copper, $4 gold and 2 oz. silver per ton. Mai shaft, 488′, with 750′ of underground openings. Former development wa misdirected, shaft being sunk at right angles to the vein. Has steam powe

CHASE CREEK COPPER CO. ARIZONA

Mine office: Clifton, Graham Co., Ariz. Capitalization $5,000,00 Clarence K. McCornick, president; I. N Stevens, superintendent. Land 44 claims, well located next to producing mines. Is developing by a lon tunnel, on lands adjoining the Longfellow mine.

CHAVEZ MINE. NEW MEXIC

A copper prospect near Riley, Socorro county, New Mexico.

CHELAN COPPER CO. WASHINGTO

Owns the Texas Jack copper claims, in Upper Horseshoe Basin, Wash ington. Vein is 30′ between walls, in places, with pay-streak of about 2 carrying copper and silver values.

CHENIUS FALLS COPPER MINING CO. WASHINGTON.

Incorporated July, 1902, with capitalization $1,000,000, by F. C. Robinson, et al, of Spokane, Wash. Has 2 claims on the Chenius river, about 7 miles from Fairfax, Pierce Co., Wash.

CHEWELAH COPPER CO. WASHINGTON.

Office: care of J. H. Long, president, Spokane, Wash. S. D. Domer, secretary. Said to be developing sundry copper claims.

CHIAPAS MINING CO. MEXICO.

Offices: 35, Queen Victoria St., London, E. C., Eng. Mine office: Chiapas, (via Teapa, Tabasco) Mexico. C. G. Hale, chairman; Don P. Maldonado, managing director; Wm. J. Oates, mine manager; G. A. B. Narraway, secretary. Capital, nominal, £252,000; issued, £233,061. Preference dividends in arrears since September, 1897. Lands, about 50 acres, including the Santa Fe mine, producing gold, silver and copper. Main shaft, 200′; tunnel, 1560′. Has water power, 30-stamp mill, 100-ton concentrator and 75-ton smelter. Production in 1901 was 531 long tons of copper.

CHICAGO COPPER REFINING CO. ILLINOIS.

Office and works: Blue Island, Cook Co., Ills. Company has a small smelter and makes a specialty of refining copper ores rich in gold and silver, and also handles copper ores and mattes containing platinum and other rare metals.

CHICAGO NICKEL CO. ONTARIO.

Owns prospects in Drury Twp., Algoma district, near Worthington, Ont., showing copper-nickel-iron ores. No returns secured, and company not thought to be operating.

CHICAGO-ALGOMA NICKEL CO. ONTARIO.

A property near Sudbury, Algoma, Ont., opened by shafts and carrying copper and nickel ores. Letters addressed to company at Sudbury returned unclaimed.

CHICAGO & ARIZONA MINE. ARIZONA.

Letter returned unclaimed from former mine office, Dos Cabezos, Cochise Co., Ariz. Thos. D. Chattman, president; P. B. Soto, secretary-treasurer. Capitalization $200,000, shares $1 par. Lands, 210 acres. Has a large ore body, apparently of good size, giving assays of $7 to $20 per ton in copper, silver and gold.

CHICAGO & KOOTENAY MINING CO. BRITISH COLUMBIA.

Letter returned unclaimed from Hall, Yale & Cariboo district, B. C.

CHICAGO-LA SAL GOLD & COPPER CO. UTAH.

Mine office: La Sal, Grand Co., Utah. Gid. R. Propper, superintendent.

CHICAGO-VENTURE MINING CO. WYOMING.

Office and mine: Encampment, Carbon Co., Wyo. Employs 8 men. Robt. H. Young, president and general manager; S. A. McCoy, secretary and treasurer. Organized 1901, under laws of Wyoming, with capitalization $1,000,000, shares $1 par. Lands, 5 patented claims, area 100 acres, showing 2 fissure veins in limestone, near a grano-diorite contact, of which one, averaging 15′ width, is developed by shafts of 60′ and 185′, and tunnels of 50′

and 60'. Idle for winter, but will resume work about June 1, 1904, where management plans installation of steam plant and resumption of sinking.

CHICAGO & YELLOW METALS MINE. **WASHINGTON.**

Has copper-gold prospects, about 20 claims, on the extension of the Norway-Sweden-Denmark belt, in the valley of the North Toutle river, Washington.

CHILCAT GOLD & COPPER MINING CO. **ALASKA.**

Plans to operate a group of 168 claims on Big Salmon river, near Haines Mission, Alaska.

J K. CHILD & CO. **BOLIVIA.**

Office and mines: Coro Coro, La Paz, Bolivia. Firm operates mines of native copper in the congolmerate strata of Coro Coro. Annual production about 600 tons of barillas de cobre (unsmelted copper mineral), carrying about 80% fine copper. Employ about 200 men.

CHILE COPPER SULPHATE SYNDICATE, LTD. **CHILE.**

Offices: 101 Leadenhall St., London, E. C., Eng. J. E. G. Hadath, secretary. Lands leased to Capaquire Copper Sulphate Co., Ltd.

SOCIEDAD CHILENA DE FUNDICIONES. **CHILE.**

Office: Santiago de Chile. Mines and works office: Tongoy, Ovalle, Chile. Operates the Tongoy mine, opened 1860, making about 700 tons of refined copper yearly; also the Guayacan mine, opened 1856, and producing about 800 tons annually. Has smelting plants at both mines, these buying custom ores also, and employs several hundred men.

SOCIEDAD UNION MINERA CHILENA. **CHILE.**

A Chilean company, operating the Condesa and Union mines, at Cobija, Tocapella, Antofagasta, Chile.

CHILLAGOE BLOCKS. (NO LIABILITY.) **AUSTRALIA.**

Offices: 47, Queen St., Melbourne, Victoria, Australia. Mine office: Herberton, Queensland, Australia. W. W. Nicholas, chairman; Thos. Rollason, secretary; W. L. Archer, mine manager. Capital, nominal, £250,000. Property is sundry claims in North Queensland, on which development work has shown tin and copper ore.

CHILLAGOE COPPER PROPRIETARY, LTD. **AUSTRALIA.**

Dissolved December 26, 1902.

CHILLAGOE RAILWAY & MINES, LTD. **AUSTRALIA.**

Reorganized as New Chillagoe Railway & Mines, Ltd.

CHIPPEWA COPPER MINING CO. **WISCONSIN.**

Reorganized as the Corona Copper Mining Co.

CHIRICAHUA DEVELOPMENT CO. **ARIZONA.**

Office: care of S. R. Kaufman, secretary, Marquette, Mich. Mine office: San Simon, Cochise Co., Ariz. Organized 1903, under laws of Arizona, with capitalization $200,000, shares $10 par. Nathan M. Kaufman, president; Jas. H. Knowles, general manager. Directors are N. M. Kaufman, Thos. F. Cole, Wm. G. Rice, S. R. Kaufman and Jas. H. Knowles. Lands, 23 claims, area 460 acres, operated by former owner, Capt. Thos. Burns, as a silver mine. Was examined by Mr. Knowles and Capt. Jas. Hoatson before work was begun by present owners in April, 1903. Surface appearances and the limited development secured indicate great similarity to conditions at Bisbee, in the Warren district. Development is by an 800′ tunnel showing about 50′ of leached ore, apparently the apex of a good sulphide ore body. Property shows a heavy iron outcrop with occasional large bunches of carbonate ore. It is planned to start a 500′ three-compartment shaft early in 1904, and a $25,000 machinery plant has been ordered. Nearest railroad is the El Paso & Southwestern, at Rodeo, which will build to the mine when assured tonnage. Company is composed of strong and successful mining men and the property is one of considerable promise.

MINAS LA CHIRIPA Y ANEXAS. MEXICO.

Mine office: Zimipán, Hidalgo, Mex. Leon Lamaire y Ca., owners, Ores carry silver, lead and copper. Employ about 100 men.

CHITTNA EXPLORATION CO. ALASKA.

A New Jersey corporation, address of which has not been learned. Property claimed is the Nicholai group of native copper claims, on the head waters of the Chittna river, Copper River district, Alaska, about 185 miles inland from Valdez, and the Bonanza group, claimed also by the Alaska Copper Co., and the Copper River Mining Co., with best title apparently held by the Alaska Copper Co.

CHLORIDE GOLD MINING CO. ARIZONA.

Mine office: Chloride, Mohave Co., Ariz. L. Hoffman, manager. Ores carry gold, silver and copper. Has steam power.

CHOIX CONSOLIDATED MINING CO. MEXICO.

Office: 516 Grant Bldg., Los Angeles, Cal. Mine office: Choix, Sinaloa, Mex. Capitalization $5,000,000,shares $5 par. Lands said to be 18 groups of claims, of 5 to 10 pertenencias each, on both sides of the Fuerte river, in the states of Sinaloa and Chihuahua, showing ores of copper, gold, silver and lead. Company issues a prospectus that does not give the name of a single officer, and failed to keep its promise to furnish full returns for this issue of the Copper Handbook. Officers are evidently of a very modest and retiring disposition.

COMPANIA MINERA Y BENEFICIADORA MEXICO.
DE METALES DE CHOIX.

Mine office: Choix, Sinaloa, Mexico. F. A. Mendoza, manager. Opererates Los Planatos mines, producing copper and silver. Employs about 40 men.

CHOTA NAGPUR MINES. INDIA.

At Chota Nagpur, Bengal, India. Were worked in very ancient days. Ore occurs as chalcopyrite, disseminated in schistose rocks. A local company has recently done a little development work on the property.

CHTASTIE MINE. BULGARIA.

Office: care of MM. Stojanoff, Varbanoff & Co., Plevna, Bulgaria. Mine office: Belogradchik, Vidin, Bulgaria. Lands, 250 hectares, held under lease from the principality, showing 2 fissures, averaging 2.5′ wide and 600′ long, carrying chalcopyrite assaying 18% copper, 8 oz. silver and 2 dwts. gold per ton. Has 3 shafts, deepest 260′ and 15 short tunnels, with about 5,000 tons of ore in sight. Was undergoing active development with early production planned at last accounts.

CIENGUITA COPPER CO. MEXICO.

Office: 25 Broad St., New York Mine office: Sahuaripa. Sonora, Mex. Employs about 100 men. Geo. Beebe, president; Dr. J M. Ford, treasurer. Mineral lands, 2,347 acres, also 1,300 acres of miscellaneous lands, fairly watered and timbered. The district is wild and slightly developed, and work is subject to interruptions by the outbreaks of the rebellious Yaqui Indians. Property includes the Mina Real de la Tayapa, a heavy producer in the olden days, and the Minas Real de las Cienguitas, said to give ores averaging 5% copper, 70 oz. silver and $3 gold per ton. Properties are developed by several thousand feet of underground openings and are claimed to have 2,000,000 tons of high grade ore in sight, which is undoubtedly an overestimate. Company plans installing an electric plant and at last accounts was building a 300-ton smelter, planned for both mating and conversion, at Chipiona. Officers of the company are men of good standing and the property is undoubtedly valuable, but the company is too forward in estimates of values and promises of dividends, and entirely too backward in giving detailed information to substantiate the rather aggressive claims made for the mines.

COMPANIA MINERA DE LA CIENGUITA. MEXICO.

Mine office: Tarachi, Sonora, Mexico. Geo. Greene, manager. Operates the Tajo, Chipiona and other mines, opened by tunnels and producing gold, silver and copper.

CINCINNATI CONSOLIDATED MINING CO. UTAH.

Office: care of A. Hanauer, Salt Lake City, Utah. Lands are in Beaver county, Utah. Officers state that company is not a producer and has no statement to give out regarding its property.

CIRCUMSTANCE GOLD & COPPER MINING CO. ARIZONA.

Mine office: Huron, Yavapai Co., Ariz. J. W. Nelson, superintendent, at last accounts.

CLAIRE COPPER CO. IDAHO.

Mine office: Montpelier, Bear Lake Co., Idaho. Employs 6 men. G. C. Gray, president and treasurer; A. D. Young, secretary. Organized Sept. 16, 1902, under laws of Idaho, with capitalization $200,000, shares 50c. par; unissued, $44,000. Lands, 3 claims, area 60 acres, in an unorganized mining district of Bear Lake county. Veins occur as fissures in sandstone and as contacts between limestone and porphyry, giving ores assaying 4.6% copper, 10 oz. silver and about $1 gold, from a 12″ vein carrying cuprite, melaconite, dioptase and chrysocolla, opened by tunnels of 100′ and 200′.

CLAIRMONT MINE. MONTANA.

Mine office: Stevensville, Ravalli Co., Mont. Amos Buck & Co., owners. A prospect on which a limited amount of development work has been done.

CLARA COPPER MINE. UTAH.

Lands are in vicinity of Thompson's Springs, Grand Co., Utah. Company said to plan installing a $40,000 leaching plant, using the process of the American Metals Extraction Co.

CLARA ST. DORA COPPER MINING CO. **AUSTRALIA.**

Offices: 142 Palmerston Bldgs., London, E. C., England, and Adelaide, South Australia. T. J. Chaney, manager. Lands, 160 acres, 32 miles west of Hergott Springs, South Australia. Mine is opened mainly by shallow shafts and open-cuts showing malachite and chalcocite, occurring as nodules in hard limestone and in veins in soft limestone. Has steam power and is said to employ about 100 men.

CLARK MINE. **MICHIGAN.**

Owned by Edouard A. J. Estivant, Paris, France. Is an old property, carrying native copper and manganese ore. Area, about 2,500 acres, located south of Copper Harbor, Keweenaw county, Mich. Opened 1858; idle for many years; total production 93 tons 1,915 lbs. fine copper.

CLAYTON MINING & SMELTING CO. **IDAHO.**

Mine office: Clayton, Custer Co., Idaho. Lawrence Greene, general manager. Lands, 18 claims. Ores carry silver, lead and copper. Has water and steam-power and a 50-ton smelter, employing about 50 men.

CLEAR CREEK MINING & REDUCTION CO. **COLORADO.**

Mine office: Russell Gulch, Gilpin Co., Colo. F. R. Carter, superintendent. Property is the Saratoga mine, carrying ores of gold, silver and copper. Has steam and electric power and also owns a pyritic smelter at Golden, Colorado.

CLEOPATRA GROUP. **OREGON & CALIFORNIA.**

Sundry claims in Josephine Co., Oregon, and Del Norte Co., California, owned by J. S. Crawford and F. H. Osgood, of Seattle. Lands, 45 claims and a 40-acre millsite, showing good copper ores and masses of native copper weighing up to several hundred pounds. District is isolated and difficult of access, but the property is regarded as promising.

CLEOPATRA COPPER CO. **ARIZONA.**

Office and mine: Jerome, Yavapai Co., Ariz. Organized 1902, under laws of Arizona, with capitalization $4,000,000, shares $1 par. G. W. Hull, president and general manager; H. E. Wilcox, secretary. Lands, 13 claims, 11 patented, area about 180 acres, in the Verde district, showing 8 fissures and gash veins, of which several are being developed, these running 1′ to 5′ in width and giving oxide, carbonate and sulphide ores, assaying 1% to 65% copper, and 1 oz. to 500 oz. silver with good gold values. Has several shafts, deepest 75′, and tunnels of 300′ and 1,250′. Has steam power and air compressor.

CLEVELAND-ARIZONA COPPER CO. **ARIZONA.**

Supposed to have copper claims near Ajo Basin, Arizona.

CLIFF MINE. **MICHIGAN.**

The oldest mine in the Lake Superior district. Was a considerable dividend payer until suspension in 1879. Is now owned by the Tamarack Mining Co.

CLIFTON CONSOLIDATED COPPER MINES OF ARIZONA, LTD. ARIZONA.

Absorbed in 1903 by New England & Clifton Copper Mines of Arizona.

CLIFTON COPPER CO. NEW MEXICO.

Office: Deming, N. M. Mine office: Santa Rita, Grant Co., N. M. Organized 1900, with capitalization $500,000, shares $5 par. J. L. Burnside, president; F. F. Rogers, secretary; M. M. Z. Elliott, superintendent. Lands are in the Central district of Grant county, with 5 shafts, deepest 235′, showing an ore body said to be 40′ to 50′ wide and a half-mile long, carrying oxide, carbonate and sulphide ores with occasional native copper. Ore is of concentrating grade, with occasional paystreaks of high-grade ores. Mine shows considerable ore ready for stoping. Has steam hoists and a 65-ton concentrator with 2 Huntington mills, 2 Wilfley tables and 2 Standard concentrators. Property has been in litigation for some time, but a satisfactory settlement was reached October, 1903. Company plans increasing concentrator to 200 tons daily capacity, and resuming work on a considerable scale.

CLIFTON COPPER MINING CO.

Promoted, 1898, by Julius Leszynsky, of New York. Financial operations were not of a sort to appeal to conservative investors. Present address of company not learned, and location of mineral lands, if any, unknown.

CLIFTON-ARIZONA COPPER CO., LTD. ARIZONA.

Succeeded by Clifton Consolidated Copper Mines of Arizona, Ltd.

CLIFTON COPPER BELT MINING CO. UTAH.

Office: 24-65 West Second South St., Salt Lake City, Utah. Mine office: Deep Creek, Utah. Clyde H. Wilson, president; Frank L. Wilson, secretary, treasurer and general manager. Capitalization $25,000, shares 5c. par. Has secured assays of 35.5% copper, 9 oz. silver and $1.20 gold per ton.

CLIFTON TINTO COPPER MINES, LTD.

Offices: 20-21 Lawrence Lane, London, E. C., Eng. Moribund.

CLIMAX MINING CO. COLORADO.

Mine office: Granite, Chaffee Co., Colo. B. H. Pelton, president. Property is the Spondulix mine, carrying ores of gold, silver and copper.

CLIMAX MINING CO. COLORADO.

Mine office: Ouray, Ouray Co., Colo. F. O. Seabury, manager. Property is the Silver Link mine, carrying ores of gold, silver and copper. Has steam and gasoline power and employs about 20 men.

CLIMAX MINING CO. WASHINGTON.

Mine office: Baring, King Co., Wash. Frank P. Smith, superintendent, at last accounts. Lands, 8 claims, with 200′ tunnel and surface trenches, showing bornite and chalcopyrite giving good assay values in gold, silver and copper.

CLUSTER MINING CO. UTAH.

Mine office: Bingham Canyon, Salt Lake Co., Utah. Lands are located between the Bingham Consolidated and United States mines. Management plans to develop property by a 1,000′ tunnel.

COAHUILA MINING & SMELTING CO. MEXICO.

Mine office: Viesca, Coahuila, Mex. Employs about 500 men. G. F.

Meehan, president; Burt H. Whiteley, vice-president; R. E. L. Meehan, secretary and general manager; F. W. Draper, superintendent. Operates the Santa Maria, Sultana and other mines, producing copper, gold, silver and ead. Has a 700′ main shaft and a 1,000′ main tunnel. Has steam and electric power and a 250-ton smelter, blown in early in 1903. Smelter and mines are connected by railroad. Is conducted as a close corporation, but is a profitable property, paying good dividends.

COAST LINE COPPER CO. **MEXICO.**

Office: La Calera, Altar, Sonora, Mex. John T. Cave, president; Judson A. Elliot, secretary; John Henderson, general manager. Organized, 1902, as successor to the Porvenir de Sonora company. Lands, include a gold property, 14 miles from Pozo, in the Ures district, and a copper property, formerly a profitable silver producer, in the Altar district.

COAST RANGE COPPER CO.

Incorporated January 16, 1903, at Roseburg, Ore., with capitalization $25,000 in 500 shares, par $50, by T. R. Sheridan, et al., to transact a general mining business.

COBAR CHESNEY COPPER & GOLD MINING CO. **AUSTRALIA.**

Mine office: Cobar, Robinson Co., N. S. W., Australia. Employs about 100 men. J. Woolcock, manager. Was opened as a gold mine, the outcrop carrying no copper, but carbonate ores were found at depth of 155′, and at 250′ depth chalcopyrite coated with melaconite come into the shaft in considerable quantities. Main shaft is about 600′ in depth, with ore carrying 3% to 8% copper and about 3 dwts. gold per ton, showing one 35′ ore body averaging 3% copper for a length of 800′. Has steam power, 10-stamp mill and 25-ton concentrator, ore and concentrates being smelted at the Great Cobar works. Produces about 150 tons of refined copper yearly.

COBRE MINING CO. **ARIZONA.**

Mine office: Florence, Pinal Co., Ariz. Is a Delaware corporation holding bond and lease on claims 10 miles east of Florence, and is sinking a 200′ shaft. Ores carry gold, silver and copper.

COBRE GRANDE COPPER CO. **MEXICO.**

Absorbed by the Cananea Cons. Copper Co., now Greene Cons. Copper Co. A few of the Cobre Grande shareholders are suing for damages against present owners of property.

COMPANIA COBRIZA. **MEXICO.**

Said to have copper property near Tepezalá, Aguascalientes, Mexico, but letter to that address returned unclaimed.

LA COBRIZA MINE. **MEXICO.**

Mine office: Matehuala, San Louis Potosi, Mex. Zalasar, Nerezo & Gonzales, owners. Zepuno Zalasar, superintendent. Produces silver, gold and copper. Mine is opened by tunnels and employs about 100 men.

COMPANIA MINERA COBRIZA Y ANEXAS. **MEXICO.**

Mine office: Alamos, Sonora, Mexico. Manuel Salazar y Perron, manager. Ores carry gold, silver and copper. Mine opened by shafts and tunnels. Employed a small force in development work at last accounts.

COCHISE COPPER MINING CO. **ARIZONA.**

Office and mine: Bisbee, Cochise Co., Ariz. L. C. Shattuck, president; S. K. Williams, secretary; Jos. Muheim, superintendent. Capitalization $5,000,000, shares $1 par. Property is sundry claims lying north of and adjoining the Copper Queen. Has a 300′ shaft in porphyry, which has cut sundry stringers showing argentiferous and auriferous chalcopyrite. Has been regarded as of small value until recently, but if the Junction Development Co. opens a mine, will become of considerable prospective value.

COCHISE MINING & MILLING CO. **ARIZONA.**

Reported dead by former officers.

COCHISE PROSPECTING, MINING & DEVELOPMENT CO. **MEXICO.**

Mine office: Bacoachi, Sonora, Mex. Employs about 40 men. I. Gates, president; P. G. Sawyer, manager; Geo. Motz, superintendent. Lands, sundry claims, including the San Eufracio, opened to a depth of 250′, with quarter mile of underground openings giving very high asssay in gold and silver. Company also has exceptionally promising copper claims in the [illegible] mountains, northern Sonora, giving surface showing indicating existence of a 100′ vein, from which some very rich specimens of copper ore have been secured.

COCONINO COPPER CO. **ARIZONA.**

Office: 420 Merchants Loan & Trust Bldg., Chicago, Ill. Mine office: Ryan, Coconino Co., Ariz., via Kanab, Utah. Organized 1901, under laws of New Jersey, with capitalization $6,000,000, shares $10 par. Donald Grant, president; L. P. Boyle, secretary; W. S. McCornick, treasurer; E. P. Jennings, general manager. Lands, 33 claims, area 660 acres, also 80 acres miscellaneous lands, showing blanket veins carrying carbonate ores estimated to average 10% copper, which are stripped and worked open-cast. Estimated amount of ore in sight is 500,000 tons, and blocked out for stoping, 100,000 tons. Smelter is at Ryan, 7 miles from mine, receiving ore by wagons. Company installed a 100-ton leaching plant using the new Neill process, late in 1902, and superintendent has stated that plant and process are an absolute success, but it cannot be learned that property is now in operation.

COLDWATER COPPER MINING CO. **COLORADO.**

Office: Kalamazoo, Mich. Mine office: Pearl, Larimer Co., Colo. Employs about 25 men. G. L. Baldwin, president; Edward Gillis, general manager; Phillip Reardon, superintendent. Lands, 6 claims, north of the Mt. Zirkel and about 3 miles south of Pearl, known as the Wolverine mine. Main shaft is 130′ deep and shows massive chalcocite and a little disseminated chalcopyrite. Has steam power. A small trial shipment made to a Chicago smelter gave returns of about 40% copper, with fair silver and gold values.

SOCIEDAD COLECTIVA. **CHILE.**

Supposed to be reopening the Tiltil mine, department of Santiago, Chile.

MINAS COLON, RECOMPENSA Y OTRAS. **MEXICO.**

Mine office: Choix, Sinaloa, Mex. Juan H. Mendoza, owner and manager. Have lead-copper-silver ore and are said to be working about 100 men.

COLONIAL COPPER CO. **NOVA SCOTIA & ONTARIO.**

Office: 32 Broadway, New York. Mine office: Advocate, Cumberland Co., N. S. Employs about 125 men. Organized January 19, 1899, under laws of West Virginia, with capitalization $5,000,000, shares $1 par. J. A. Hanway, president and general manager; H. D. Hanway, secretary; A. Munger, treasurer; S. M. Archibald, superintendent. Lands, about 2,000 acres, showing 6 contact veins, of which 3 are being developed, these having an average width of 25′ and carrying about 2.5% copper. Has 2 vertical and one incline shaft, latter 500′ in depth. Machinery outfit includes 3 Rand air compressors, 3 large and 6 small hoists, drills, etc. Has a 400-ton concentrating mill, with Blake crushers, rolls, jigs, tables, screens, etc., connected with mine, 1½ miles distant, by a 36″ gauge railroad. Nearest railway is 30 miles distant, but property is located on the shore of the Bay of Fundy and receives all machinery and supplies by water. Company also owns the New Annan mine, carrying sulphide ore in lenses, and the Chandos mine, in Peterboro county, Ontario, latter showing a 4′ vein assaying 8% copper, but now idle. Begun building a 200-ton concentrator September, 1902. Company plans a 6% bond issue of $300,000.

COLONIAL COPPER CORPORATION, LTD. **AUSTRALIA.**

Offices: Salisbury House, London, E. C., Eng. Mine office: Lithgow, Robinson Co., N. S. W., Australia. G. Hardie, chairman; C. P. Oswald, secretary; J. Wills, mine manager. Registered, March 29, 1899. Capital, nominal, £125,000; issued, £102,507. Lands, 245 acres. No work being done at present and property is to let on tribute.

LA COLORADO MINE. **MEXICO.**

Mine office: San Xavier, Sonora, Mex. Don Carlos Yanes, owner. Was working a small force, driving a tunnel to develop copper ores, at last accounts.

COLORADO CONSOLIDATED MINING CO. **COLORADO.**

Mine office: Cochetopa, Saguache Co., Colo. Ores carry gold, silver and copper. Has steam power and 10-stamp mill, employing about 20 men.

COLORADO COPPER CO.

Stock put on the market by Wm. F. Wernse & Co., 421 Olive St., St. Louis, Mo., notorious promoters of swindling mining companies. Company said to have lost its lands and stock worthless.

COLORADO MINING & DEVELOPMENT CO.. **MONTANA.**

Office: 19 East Broadway, Butte, Mont. Mine office: Corbin, Jefferson Co., Mont. Capitalization $600,000, shares $1 par. Lands, sundry claims in the Corbin district, including the Hidden Treasure and Copper Queen mines, showing assay values in copper, gold and silver. Will probably change title early in 1904 to Corbin-Wickes Copper Mining Co., and increase capitalization to $1,000,000.

COLORADO MINING & SMELTING CO. **MONTANA.**

Mine office: Butte, Silver Bow Co., Mont. Capitalization $2,500,000. Is entirely owned, except founders' shares, by the Amalgamated Copper Co. Employs about 400 men. Geo. T. McGee, superintendent. Operates the

Gagnon mine, in the western limits of the Butte copper zone, ore from w is decidedly zinciferous and the richest in silver of any Butte copper n Has a 3-compartment 1,800′ main shaft, sunk at an angle of 74°, with ai shaft of the same depth 700′ to the westward. Has steam and electric po with a 22x48″ Dickson hoist operating 3-ton skips, and a 10-drill Ranc compressor. Has a smelter at Butte, operating on the Gagnon ores doing a general custom business, producing matte which is converted at Washoe plant in Anaconda. Production is about 7,500,000 lbs. of ref copper yearly.

The following table gives a summary of operations and results for fiscal year ending June 1, 1903:

Tons of ore extracted	235,680
Gross yield	$998,638.89
Cost of extraction	581,126.24
Cost of extraction, per ton	2.46
Cost of transportation	37,693.39
Cost of transportation, per ton	.16
Cost of reduction	336,728.29

Recapitulation:

Gross proceeds	$998,638.89
Cost of mining	581,126.24
Freight on ore	37,693.39
Cost of reduction	336,728.29
Total expense	955,547.92
Net proceeds	43,090.97

COLORADO & CONNECTICUT GOLD MINING CO. **COLORA**

Office: 35 Wall St., New York. Organized 1902, under laws of S Dakota, with capitalization $400,000, shares $5 par, non-assessable. Garlick, president; A. S. Garlick, secretary. Lands, 3 claims, area 21 a in the Galena district of Hinsdale county, Colorado. Company is prosp ing three 2′ fissure veins, giving assays of 9% to 19% copper, with good si values, from chalcopyrite, tetrahedrite and occasional silver-glance. H 50′ shaft and 800′ tunnel.

COLORADO RIVER GOLD & COPPER CO. **CALIFOR**

Office: 405 Mason Opera House Blk., Los Angeles, Cal. Mine of Mellen, Cal. Employs 3 men. E. W. Peck, president and general mana Paul C. Thorne, secretary; E. S. Gannon, treasurer and assistant mana Wm. T. Field, superintendent. Organized July 1, 1901, under laws of zona, with capitalization $1,500,000, shares $1 par; unissued, $650, Lands, 10 claims, area 200 acres, in the Monumental district of San Bern ino county, showing 9 fissure veins or lenses, of which one is of 3′ ave width, opened by shafts of 50′ and 100′ and several short tunnels, ret ing average assays of 7% copper, 2 oz. silver and $13.50 gold per from malachite, chalcopyrite and pyrrhotite. Company contemplates stalling steam power and a concentrator, or selling the property.

COLOSSAL GOLD & COPPER CO. **UTAH.**

Organized 1902, with capitalization $600,000, by F. F. Brown, Wallace W. Wait, et al., at Salt Lake City, Utah, to take over the C. M. C. group of claims, in Beaver county, Utah.

COLUMBIA COPPER CO. **ARIZONA.**

Office: 919 Chestnut St., St. Louis, Mo. Zach. W. Tinker, president; A. L. Steinmeyer, secretary; P. J. Cole, superintendent. Has mining property near Globe, Gila Co., Arizona, showing argentiferous and auriferous copper ores, very slightly developed. Has steam power.

COLUMBIA COPPER MINING CO. **ARIZONA.**

Supposed to have claims near Jerome, Yavapai Co., Ariz.

COLUMBIA COPPER MINING CO. **UTAH.**

Property sold, 1903, to the Ohio Copper Co.

COLUMBIA RIVER GOLD MINING CO. **WASHINGTON.**

Mine office: Kettle Falls, Stevens Co., Wash. J. M. Fish, superintendent. Ores carry gold, silver and copper. Has steam power.

COLUMBUS CONSOLIDATED MINING CO. **UTAH.**

Office: 10 Atlas Blk., Salt Lake City, Utah. Mine office: Alta, Salt Lake Co., Utah. Employs about 25 men. Anthony O. Jacobson, president and general manager; C. K. McCornick, vice-president; Arthur E. Snow, secretary and treasurer. Organized, 1902, under laws of Utah, with capitalization $150,000, shares 50c. par. Lands, 14 claims, area 145 acres, in the Little Cottonwood district, showing 9 fissure and contact veins, of which 6 are said to average 12′ width, carrying estimated average values of 2.5% copper, 18% lead, 15% zinc, 14 oz. silver and $1 gold per ton. Principal ore bodies are fissure and contact veins in limestone and quartzite, with highly mineralized sections ranging 30′ to 100′ wide for several hundred feet in distance. Ores are carbonate on surface and mainly sulphides at depth, concentrating 4 or 5 into 1. Has 4 shallow shafts and 3 tunnels, longest 900′, with a considerable amount of ore blocked out for stoping. Has 2 Pelton wheels, actuated by water under a head of 494′, delivered through 4,500′ of 20″ and 22″ steel pipe, developing 660 h. p., which is transformed into electricity by two 3,000-kw. dynamos and carried to the mine by a 4½-mile electric transmission line, nearing completion at the end of 1903. Has a 15-drill air compressor and power drills. In 1903 shipped some high-grade ore netting $70 per ton, also 977 tons of smelting ore that gave average returns of upwards of $29 per ton, netting $28,829.20 during the last three months of 1903. Ore is sold to the American Smelting & Refining Co. under a two-year contract providing for a maximum tonnage of 2,000 tons monthly. The management is experienced and honest, and the property is considered valuable

COLUSA-PARROT MINING & SMELTING CO. **MONTANA.**

Office and mine: 10 West Broadway, Butte, Silver Bow Co., Mont. Hon. W. A. Clark, president; A. H. Wethey, secretary and manager; Thos. Bryant, superintendent. Company is capitalized at $1,000,000 and operated as a close corporation. Lands include the Colusa-Parrot, Original, East Stewart, West Stewart, Dives, Woolman and Home mines. Main shaft on the Original is 1,400′ in depth, with two compartments. The East Stewart has a 1,300′ three-compartment incline shaft, with 120′ steel gallows-frame; the West Stewart a shaft of 1,100′ with 120′ steel gallows-frame. All the working mines have underground connections with adjoining properties and are well ventilated and equipped, with duplicate 32″x72″ Nordberg hoists at the Original and West Stewart mines. Property has a good mining equipment, recently improved. Two 50-drill Ingersoll-Sergeant air compressors are being installed at the Original, to be operated by two 500-h. p. induction motors taking power from the Canyon Ferry plant. Has a 1,000 ton smelter, rebuilt in 1902, with 2 additional furnaces under construction. For the year ending June 30, 1903, ore production was 265,113 tons, giving a gross yield of $8.29 per ton. Cost of mining was $3.70 per ton, and of transportation 22.9c. per ton. Net profits were $245,785.

COMANCHE MINING & SMELTING CO. **NEW MEXICO.**

Office: 602 Goldsmith Bldg., Milwaukee, Wis. Mine office: Silver City, Grant Co., N. M. Organized 1902, under laws of New Mexico, with capitalization $5,000,000. S. S. Curry, president and treasurer; Chas. J. Laughren, secretary. Lands, 38 claims, area 760 acres, in the Burro mountains, 13 miles from Silver City, showing cuprite, malachite, azurite and chrysocolla. Had an option on the Hearst smelter at Silver City, which was burned June 30, 1903. Mine idle at last accounts.

COMMERCE GOLD & SILVER MINING CO. **ARIZONA.**

Supposed to have claims near Duncan, Graham Co., Ariz., but letter to that address returned unclaimed.

COMMODORE COPPER MINING CO. **WYOMING.**

Letter returned unclaimed from former office, Encampment, Carbon Co., Wyo.

COMMODORE MINES, LTD. **BRITISH COLUMBIA.**

Capitalization $750,000. Jas. R. Webster, president; W. H. Pegram, secretary. Advertises head office at Vancouver, B. C., but letter to company at that address returned unclaimed.

COMSTOCK MINE. **MONTANA.**

Mine office: Basin, Jefferson Co., Montana.

COMSTOCK MINING CO. **WYOMING.**

Office and mine: P. O. Box 132, Encampment, Carbon Co., Wyo. Wm. Norell, president and general manager; C. B. Bergquist, secretary. Organized Oct. 1, 1900, under laws of Wyoming, with capitalization $1,000,000, shares $1 par; unissued, $442,150. Lands, 5 claims, area 103 acres, also a 20-acre millsite, in the Battle Lake district, showing 4 fissure veins, of which 2, averaging 16′ width and giving assays of 15% copper, 20 oz. silver and $3.15 gold per ton, have been cut by a 250′ tunnel.

COMSTOCK & TASMAN LYELL, CONSOLIDATED. **TASMANIA.**

Was employing 13 men in prospecting on the western slope of Mt. Lyell, Montague county, Tasmania, at last accounts.

LAS CONCAVAS MINE. **COSTA RICA.**

An old copper property in Costa Rica, opened in the Eighteenth Century or earlier. Now idle.

COMPANIA MINERA CONCEPCION DEL ORO. MEXICO.

Mine office: Concepcion del Oro, Zacatecas, Mexico. Organized 1902, with capitalization $30,000, shares $30 par. Santiago Chamberlain, president; J. L. Kowalski, secretary and general manager; Santiago Chamberlain, Jr., superintendent; Juan Sanchez, mining captain. Lands, 32 pertenencias, area about 80 acres, in the Mazapil district. Vein averages 4′, carrying oxide ores averaging 30% copper, with gold and silver values. Shaft, 33 metres. Ore is shipped 336 miles to smelters at San Luis Potosi. Has gasoline power and employs a considerable force.

CONCRETE GOLD MINING CO. COLORADO.

Office: 324 Cooper Bldg., Denver, Colo. Mine office: Central City, Gilpin Co., Colo. Saml. V. Newell, superintendent. Ores carry gold, silver, lead and copper. Has steam power and employs about 25 men.

CONDON MINE. ARIZONA.

Office and mine: Oracle, Pinal Co., Ariz. T. C. Condon, owner; Geo. E. Metz, superintendent, at last accounts. Has gasoline power.

COMPANIA MINERA DE CONDORIACO. CHILE.

Mine office: La Serena, Coquimbo, Chile. Has steam power and employs 50 to 75 men.

CONEJO-COLORADO MINING CO. MEXICO.

Mine office: Ocotlán, Oaxaca, Mex. F. B. Morse, manager. Produces gold, silver and copper. Mine opened by shafts and tunnel. Has steam power, 5 stamps, 2 Huntington mills and 30-ton cyanide plant. Employs about 100 men.

CONGOR GOLD & COPPER MINING CO.

Office: 506 Auerbach Bldg., Salt Lake City, Utah. Location of property, if any, unknown. Company gives no answer to inquiries.

CONGRESS COPPER MINING CO. COLORADO.

Mine office: Red Mountain, Ouray Co., Colo. Geo. H. Foltz, manager. Has cupriferous gold and silver ores, opened by shafts and equipped with steam power, employing about 20 men.

CONGRESS GOLD & COPPER MINING CO. WASHINGTON.

Office: Spokane, Wash. Joseph Roslow, president; J. Goodrich, secretary. Lands, about 80 acres, in the Keller district of Ferry Co., Wash. Mine opened by shafts and tunnels, on 2 veins giving good assay values in gold, silver and copper, with some nickel. Cannot be learned that any work is in progress.

E. P. CONNOR CO. CALIFORNIA.

Supposed to own gold and copper claims in the vicinity of Redding, Shasta Co., Cal. Was stated in the press that company proposed erecting a 200-ton smelter, but no confirmation secured.

CONQUEST CONSOLIDATED MINING CO. WASHINGTON.

Office: 426 Postal Telegraph Bldg., New York, Mine office: Newport, Stevens Co., Wash. John H. Shaw, president; J. W. Hays, secretary. Is a consolidation of the Conquest Gold & Copper Mining & Milling Co. and the American Eagle Mining & Milling Co. Lands, 12 claims, showing 3 veins of 4′ to 8′ width, opened by about 2,200′ of tunnels.

CONSERVATIVE MINING CO. **WASHINGTON.**

Office: Snohomish, Wash. Mine office: Silverton, Snohomish Co., Wash. Frank M. Evans, president; Hugh Kennedy, secretary and manager. Property idle at last accounts.

CONSOLIDATED COPPER CO. **BRITISH COLUMBIA.**

Former office, Ainsworth, B. C. Dead.

CONSOLIDATED COPPER CO., LTD. **CORSICA & MEXICO.**

Offices: Dashwood House, London, E. C., Eng. F. Hawdon, chairman; C. Cook, secretary; Thos. P. Rowe, manager. Capital, nominal, £100,000; issued, £92,500. Lands, include La Bufa de Charcas claims, carrying copper, silver and lead ores, in the state of San Luis Potosi, Mexico, and sundry adjoining claims; also the Lacone copper mines, in Corsica, on which work has been suspended.

CONSOLIDATED COPPER CO. OF PARRY SOUND. **ONTARIO.**

Office: Duluth, Minn. Property, sundry lands in the Parry Sound district of Ontario, including former holdings of the Hattie Belle Gold, Copper & Nickel Co. Is asserted to have 4,000,000 tons of ore in sight, claimed to carry net values of $10 to $15 per ton.

CONSOLIDATED COPPER CO. OF VIRGINIA.

Office: 317 Broadway, New York. Organized 1902, under laws of South Dakota, with capitalization $100,000,000. Franklin Bien, president; Nathan E. Clark, secretary. Location of company's properties, if any, unknown. Thought to have some connection with the United Copper Co.

CONSOLIDATED COPPER MINING CO. **IDAHO.**

Mine office: Mineral, Washington Co., Idaho. G. W. McDowell, general manager. Is opening a 40′ vein carrying argentiferous copper ores. Has steam power and a small smelter, employing about 50 men.

CONSOLIDATED COPPER MINING, MILLING & SMELTING CO. **COLORADO.**

Office: 417 Temple Court, Denver, Colo. Mine office: Eldora, Boulder Co., Colo. Employs 20 men. Organized 1899, under laws of Colorado, with capitalization $3,000,000, shares $1 par. J. B. Johnson, president and general manager; E. W. Kelly, secretary; K. W. Hunt, mine superintendent. Lands, 14 claims, area 130 acres, in the Grand Island district, showing 4 contact veins between granite and phonolite, one with a width of about 200′ having a 3′ to 20′ paystreak that gives an average assay of 15% copper, 15% lead, 40 oz. silver and $20 gold per ton, from bornite and chalcopyrite. Main shaft, 360′; also a 1,350′ tunnel, with about 2,500′ of underground openings. Has a 100-h. p. steam equipment and 3-drill air compressor. Company intends completing tunnel in 1904 and does not plan stoping until tunnel is finished.

CONSOLIDATED GOLD & COPPER CO. **ARIZONA.**

Office: 66 Broadway, New York. Mine office: Clifton, Graham Co., Ariz. Capitalization $1,000,000, shares $1 par. John I. Hutchinson, president; Fred K. Jones, secretary. Lands, sundry claims near the mines of the Arizona Copper Co., partly developed by tunnels and shafts, also lands in

Yavapai county, Arizona. Has paid one dividend of $490.71. Promoted by Douglas, Lacey & Co. Idle.

CONSOLIDATED GOLD, COPPER & COAL CO. **WYOMING & COLORADO.**

Mine office: care of W. C. Henry, Encampment, Carbon Co., Wyo. J. E. Hedding, president. Is understood to have been formed to act as a merging company for sundry coal and copper mining corporations in Carbon and Albany counties, Wyoming, and Larimer county, Colorado.

CONSOLIDATED GOLD & COPPER MINING CO. **UTAH.**

Office: 25 Broad St., New York. Mine office: La Sal, Grand Co., Utah. A. Graham Donnelly, president; Gid R. Proper, superintendent. Capitalization $20,000,000. Claims to have lands in Utah, Montana, Colorado and Oregon. Is grossly over-capitalized.

CONSOLIDATED GOLD & COPPER MINING & MILLING CO. **WYOMING.**

Supposed to have lands near Encampment, Carbon Co., Wyo.

CONSOLIDATED MINING & SMELTING CO. **NEW MEXICO.**

Mine office: Cerillos, Santa Fe Co., N. M. R. B. Thomas, manager; J. L. Wells, superintendent. Ores carry gold, silver, lead, copper and zinc. Company works the Tom Paine, Albany and other mines, extensively developed, well equipped with gasoline and electric power, and employing about 150 men. Has a 120-ton smelter and secures a little copper as a by-product.

CONSOLIDATED MINING & SMELTING CO. **UTAH.**

Formerly at Brigham, Box Elder Co., Utah. Dead.

CONSOLIDATED AFRICAN COPPER TRUST, LTD. **RHODESIA.**

Offices: 8, Old Jewry, London, E. C., Eng. Dr. Hans Sauer, chairman; H. A. Piper, consulting engineer; H. G. Sidgreaves, secretary; Cyril E. Brackenbury, mine manager. Captial, nominal, £600,000; issued, £474,500. Lands, 135 claims, including the Alaska mine in the Lomagunda district of Rhodesia, also sundry valuable gold claims and right to locate all copper claims within an area of 1,242 square miles. The Alaska mine is about 90 miles northwest of Salisbury and 30 miles from a railroad. This shows the second largest ancient workings in Rhodesia. The ore bodies have an average width of 150′ and length of 1,700′. Copper ore has been found at depths of 200′ to 800′ in numerous diamond drill borings. Company has suffered from the shortage of labor now prevailing in South Africa. Property is regarded as decidedly promising.

CONSOLIDATED GEM MINES CO. **COLORADO.**

Mine office: Idaho Springs, Clear Creek Co., Colo. W. S. Renshaw, manager. Ores carry gold, silver, lead and copper. Has steam power and 10-stamp mill, employing about 40 men.

CONSOLIDATED JEFFERSON GOLD & COPPER MINING CO. **UTAH.**

Organized June, 1902, under laws of Utah, with capitalization $1,000,000.

CONSOLIDATED KING DEVELOPMENT & COLUMBIA COPPER MINING CO. **ARIZONA.**

Office and mines: Jerome, Yavapai Co., Ariz. Organized under laws of Arizona, with capitalization $6,000,000, shares $1 par. Geo. W. Hull, president; H. E. Wilcox, secretary. Lands, 34 claims, area 400 acres, in the Verde district, showing several ore bodies carrying oxide, carbonate and sulphide ores give assay values in copper, gold and silver, opened by a 400′ shaft and several tunnels, longest 1,200′. Has gasoline power and employs about 20 men.

CONSOLIDATED STANLEY MINING & MILLING CO. COLORADO.

Office: Jacksonville, Ills. Mine office; Idaho Springs, Clear Creek Co., Colo. John M. Jackson, superintendent. Ores carry gold, silver, lead and copper. Has steam and water power, with 10-stamp mill, and employs about 40 men.

COMPANIA MINERA LA CONSTANCIA. MEXICO.

Office: Saltillo, Mexico. Mine office: La Esmeralda, Coahuila, Mex. Daniel Sada, general manager. Operates the Juarez, Providencia, General Escobedo and other mines, producing ores of silver, lead and copper. Main shaft, 550′; also a 2,000′ tunnel. Has steam power and employs a considerable force.

CONSTANTINE COPPER MINING CO. WYOMING.

Office: 76 East Third St., Winona, Minn. Mine office: Encampment, Carbon Co., Wyo. W. H. Elmer, president; Earle C. Clemens, secretary; P. J. Winters, superintendent. Is developing by tunnel.

CONSTELLATION MINES. ARIZONA.

Mine office: Briggs, Yavapai Co., Ariz. Wm. F. Roberts, owner. Ores carry gold and copper values.

CONSTELLATION MINE. CALIFORNIA.

Mine office: Campo Seco, Calaveras Co., Cal. C. Berger, owner; E. J. Berger, superintendent. Has steam power and was working a small force at last accounts.

CONSTELLATION GOLD MINES CO. OREGON.

Mine office: Sumpter, Baker Co., Ore. J. Higgins, superintendent. Ores carry gold, silver, lead and copper. Employs 12 men.

MINA CONSUELO. MEXICO

Office: care of Dr. A. F. Gavilan, owner, Durango, Mex. Letter returned unclaimed, from former mine office, Yerbaniz, Durango, Mex. Ores carry copper, silver, gold and lead.

COSUMNES MINE. CALIFORNIA.

Now held by the Rio Vista Gold & Copper Mining Co.

CONTACT GROUP. ARIZONA.

Office: care of A. A. Patterson, Globe, Gila Co., Ariz. A group of 7 claims, near the Bobtail mine, about 15 miles from Globe.

CONTENTION MINING CO. COLORADO.

Mine office: Silverton, San Juan Co., Colo. G. E. Collins, manager. Ores carry gold, silver and copper values. Mine has steam and water power and employs about 40 men.

CONTINENTAL COPPER CO. WYOMING.

Office: Colorado Springs, Colo. Lands, in vicinity of Battle, Carbon county, Wyoming. John M. Harran, president; J. W. Wallwork, secretary.

CONTINENTAL COPPER MINING CO. WYOMING.

Mine office: Battle, Carbon Co., Wyo. J. T. Brown, superintendent, at last accounts. Property is in the Cow Creek district, and is said to give promise of a large body of low-grade ore.

CONTINENTAL MINES & SMELTING CORPORATION. UTAH.

Offices: 90 Wall St., New York, and 409 Dooly Bldg., Salt Lake City, Utah. Mine office: Alta, Salt Lake Co., Utah. Employs 25 to 75 men, according to season. Henry M. Crowther, president; G. C. Van Alstyne, secretary and treasurer; W. G. Scott, superintendent. Organized July, 1903, under laws of New York, with capitalization $5,000,000, shares $10 par. Is paying 10% dividends on stock issued. Empire State Trust Company, 88 Wall St., New York, registrar. Lands, 18 claims, area 220 acres, also 20-acre millsite, in the Little Cottonwood district. Country rocks are limestone, porphyry, quartzite and granite, showing 20 contact veins of 1′ to 40′, between limestone and porphyry, giving assays of 2% to 35% copper, 10% to 48% lead, 7.5% zinc, 15 to 120 oz. silver and 60c. to $5 gold per ton, from malachite, azurite and oxide ores of copper, galena, sphalerite, etc. Has 5 shafts, deepest 200′, and 9 tunnels, of 300′ to 2,000′, with total underground openings of 7,682′. Estimated amount of ore blocked for stoping is 24,000 tons. Mine was discovered 1864, opened 1870, closed 1892, reopened 1899. Has gasoline power. Production of metals to end of 1902 is estimated at $1,002,000. Estimated value of ore is about $25 per ton. Company contemplates the erection of a 7-mile aerial tramway, and 10-mile railroad and also the improvement of an avaliable water-power to give 600 h. p.; also the erection of a 200-ton concentrator in 1904.

CONTINENTAL MINING CO. WYOMING.

Office: 20 Metropolitan Opera House Bldg., St. Paul, Minn. Mine office: Encampment, Carbon Co., Wyo. A. L. Cox, president; Ker D. Dunlop, secretary and treasurer. Organized 1898, under laws of Wyoming, with capitalization $800,000, shares $1 par. Lands, 7 claims, area 120 acres, also 20-acre millsite, in the Battle Lake district. Is developing a 20′ vein by 2 tunnels, longest 690′. Mine is served by the aerial tramway of the North American Copper Co.

CONTINENTAL ALTA MINES. UTAH.

Owned and operated by the Continental Mines & Smelting Corporation.

COONEY MINE. NEW MEXICO.

Owned and operated by Mogollon Gold & Copper Co.

COONEY HILL GOLD & COPPER MINING & MILLING CO. WYOMING.

Office: Cheyenne, Wyo. John Brown, secretary. Property supposed to be in the Encampment district of Carbon Co., Wyo.

CO-OPERATIVE MINING CO. WASHINGTON.

Letter returned unclaimed from former mine office, Berlin, King Co., Wash.

CO-OPERATIVE MINING & MILLING CO. WYOMING.

Mine office: Encampment, Carbon Co., Wyo. S. E. Phelps, secretary.

Is sinking on a fissure vein traversing schists and quartzite and carrying iron oxides.

COPAQUIRE COPPER SULPHATE CO., LTD. CHILE.

Offices: 101, Leadenhall St., London, E. C., Eng. Mine office: Copaquire, Tarapaca, Chile. L. Campbell-Johnston, chairman; J. G. Green, mine manager; C. R. Enoch, mining engineer; J. E. G. Hadath, secretary. Capital, nominal, £300,000; issued, £271,152. Property consists of sundry deposits of natural sulphate of copper, held under contract from the Chile Copper Sulphate Syndicate, claimed to show upwards of 100,000,000 tons of ore. Company is arranging to erect a 1,000-ton reduction plant, and is either a big mistake or an enterprise of vast possibilities.

EL COPETE COPPER MINES. MEXICO.

See Copete Mining Co.

COPETE MINING CO. MEXICO.

Office: 27 William St., New York. Mine office: El Copete, Sonora Mex. Apparently idle. Walter S. Logan, president; Myra B. Martin, secretary; Chas. F. Spraker, superintendent. Prof. Geo. A. Treadwell claimed in 1900 to have found 10,000 tons of ore, averaging 10% copper and $10 to $60 gold per ton, on the dumps, ready for smelting, and "no trouble to get million of tons of similar ore." If this be true, it is rather remarkable that the ore on the dumps has not been smelted. As a matter of fact is it not at all probable that Prof. Treadwell found any such amount or value of ore. The Spanish and native miners of Mexico are not fools, and do not leave ore of this grade unsmelted after mining. The property has a water system with four miles of pipe, and has a large traction engine for transportation purposes. Has a small smelter, rated by company at 200 tons daily capacity, which is said to have produced upwards of $100,000 in a short run. Company has had some internal dissensions, but these are thought to have been settled. Company claims that the gold values will cover cost of mining and reduction, leaving the copper cost-free, which, of course, is not true. Prof Robt. T. Hill, of the United States Geological Survey, a competent and conservative authority, who has examined this property states that the mine is probably valuable, but emphatically disclaims endorsing the company. However, the Copete Mining Co. continues to print misleading advertisements carrying the alleged endorsement of Prof. Hill.

COPETE & MELCZER MINING CO. MEXICO.

Succeeded by Copete Mining Co.

COPIAPO MINING CO., LTD. CHILE.

Offices: 19, Leadenhall St., London, E. C., Eng. Mine office: Copiapo, Atacama, Chile. A. Holland, chairman; W. T. Holberton, mine manager; W. S. Bartlett, secretary. Capital, nominal, £250,000. Company has been a considerable dividend payer, but disbursed no profits in 1903, though securing small net earnings. Mines include the San Francisco, 325′ deep, Carmen Alto, 225′ deep, and the Descubridora, 600′ deep, at Copiapo. The Dulcinea, opened 1854 and exactly one half-mile in depth, being the deepest mine in Chile, is at Puquios. Also owns the Ojancos group, recently purchased, and the Republicana mine. Properties are estimated to have about 20,000 tons of 16% ore opened for stoping. Annual production is about 3,500,000 pounds of refined copper.

COPPER AGE MINING & SMELTING CO. WYOMING.

Mine office: Battle, Carbon Co., Wyo. Lands, 12 claims, 2 miles north of Battle. Had a 150′ shaft, with vein showing a 4′ pay-streak carrying chalcocite. Was driving tunnel and planned installing a steam plant at last accounts.

COPPER BAR MINING CO. WYOMING.

Mine office: Saratoga, Carbon Co., Wyo. W. J. Crane, president and general manager. Ore body has a 17′ gossan capping, and is being developed by shaft, with steam power.

COPPER BASIN GOLD & COPPER MINING CO. ARIZONA.

Office and mine: 42 Bank of Arizona Bldg., Prescott, Yavapai Co., Ariz. Capitalization $1,000,000, shares $1 par. Alfred B. Noxon, president and secretary; W. W. Munds, superintendent. Lands, 17 claims. Has a 140′ shaft and has secured good assay values from auriferous and argentiferous copper ores. Has steam power and employs 10 to 15 men.

COPPER BASIN MINING CO. COLORADO.

Mine office: Placerville, San Miguel, Co. Colo. B. B. Harlan, president, Chicago, Ills.; Milton Evans, superintendent. Lands, 15 claims. A carload of ore shipped to smelter returned 14% copper and $2.50 gold per ton. Was sinking shaft, with small force, at last accounts.

COPPER BELL MILL & MINING CO. MONTANA.

Office: Milwaukee, Wis. Mine office: Clinton, Missoula Co., Mont. W. D. Carrick, vice-president; W. K. Ketcham, superintendent. Organized 1900, under laws of Washington, with capitalization $2,500,000, shares $1 par. Lands, 10 claims. Main shaft 212′, with tunnels of 200′ on the Clinton vein and 560′ on the Granite vein, showing ores carrying gold, silver, lead and copper. Has steam power.

COPPER BELLE MINING CO. ARIZONA.

Bankrupt. A. H. Emmanuel, receiver. Lands, 8 claims, in the Turquoise district near Gleeson, Cochise county, Arizona, with a 50-ton smelter that was a failure. Property thought to be valuable, but tied up by litigation.

COPPER BELT MINING CO. MONTANA.

Said to have a group of claims in the Wallace district, Missoula county, Mont.

COPPER BELT MINING CO. UTAH.

Office and mine: Marysvale, Piute Co., Utah. Organized 1901, under laws of Utah, with capitalization $1,000,000, shares $2 par. Saul Krotki, president; L. H. Bartholomew, vice-president and general manager; Elnor Bartholomew, secretary. Lands, 45 unpatented claims, area 900 acres, also a 20-acre millsite, showing 4 fissure veins, claimed to have an average width of 8′ and to give average assay values of 7% copper, 8% to 55% lead, 40 oz. silver and $15 gold per ton from sulphide ores opened by 4 shafts, deepest

400′, and tunnels of 125′, 150′ and 500′. Has steam power. Company unable to pay its debts at last accounts and mine probably idle.

COPPER BELT MINING & MILLING CO. WYOMING.

Mine office: Rawlins, Carbon Co., Wyo. Lands, 35 claims, of which 12 adjoin the Ferris-Haggerty and Osceola mines of the North American Copper Co., 23 claims being in the Rawhide Buttes district, north of Guernsey. Company is said to plan extensive developments.

COPPER BULL MINING CO. COLORADO.

Offices: 306 Continental Bank Blk., St. Louis, Mo., and L. B. 507, Pueblo, Colo. Mine office: Walsenburg, Huerfano Co., Colo. Employs 5 men. Organized 1901, under laws of Arizona, with capitalization $3,000,000, shares $1 par. Chas. R. Mason, president; Isaac M. Mason, secretary and treasurer; Chas. O. Unfug, general manager; H. S. McIntyre, superintendent. Lands, 32 claims, area 320 acres, showing five 7′ fissure veins carrying oxide ores with claimed values of 10% copper, $80 gold and 2 oz. silver per ton. Has shafts of 202′ and 238′, with 1,000 tons of ore blocked out for stoping.

COPPER BULLION MINING CO. ARIZONA.

Office: 224 Byrne Bldg., Los Angeles, Cal. Mine office: Pearce, Cochise Co., Ariz. Idle. Organized 1900, under laws of Arizona, with capitalization $1,000,000, shares $1 par. Ezra T. Stimson, president; Percy H. Clark, secretary; Chas. M. Renaud, superintendent. Lands, 30 claims, in the Turquoise district, showing 3 veins said to average 14′ in width, and assaying 9% copper, $4 gold and 7 oz. silver per ton, from carbonate and sulphide ores. Has 4 shafts, deepest 210′, and tunnels of 80′ and 900′.

COPPER BUTTE MINING CO. SOUTH DAKOTA.

Mine office: Custer, Custer Co., S. D. Harry Francis, superintendent. At close of 1903 planned to begin ore shipments to the National smelter at Rapid City, South Dakota.

COPPER CANON MINING CO. NEW MEXICO.

Mine office: Abiquiu, Rio Arriba Co., N. M. J. E. Irvine, superintendent, at last accounts.

COPPER CANYON MINE. BRITISH COLUMBIA.

Claims near the foot of Mt. Sicker, British Columbia. Opened by two tunnels, on a 4′ vein, showing good ore. Supposed to be idle.

COPPER CAVE MINING CO. WYOMING.

Office and mine: care of J. F. Crawford, Saratoga, Carbon Co., Wyo.

COPPER CENTER GROUP. MEXICO.

A group of claims near Montezuma, Sonora, Mexico, on which some development work has been done by Dew R. Oliver, of San Francisco, Cal.

COPPER CENTURY GROUP. ARIZONA.

Mine office: Washington, Santa Cruz Co., Ariz. Geo. A. Lonsberry, superintendent. Ores carry copper, zinc, lead and silver. Has gasoline power.

COPPER CHIEF MINING CO. ARIZONA.

Mine office: Jerome, Yavapai Co., Ariz. Arthur Hendy, superintendent. Lands, about 5 miles south of Jerome, near the Iron King mine of the

Equator company, show a large body of auriferous and argentiferous copper ore. Has steam power and a small leaching plant. Was formerly under option to Tharsis Sulphur & Copper Co., Ltd.

COPPER CHIEF MINING CO. **MONTANA.**

Office: 604 Rookery Bldg., Spokane, Wash. Employs 5 men. H. A. Fosselman, president; F. M. Longshore, secretary. Organized June, 1901, under laws of Washington, with capitalization $375,000, shares 25c. par. Lands, 5 claims, area 100 acres, showing a 30′ fissure vein in granite, opened by shafts of 45′, 70′ and 135′ showing carbonates at surface with chalcopyrite and a little chalcocite at depth, giving average assays of 12.5% copper, 2 oz. to 5 oz. silver and $1.60 to $9 gold per ton. Has steam power and necessary mine buildings. For 1904 plans sinking main shaft 250′, thence crosscutting and drifting.

COPPER CHIEF MINING CO. **NEW MEXICO.**

Property of company in New Mexico was forfeited to Jared Sater, who organized the Sater Copper Co., protecting shareholders of the Copper Chief by giving them new stock to the equivalent of their stock in the dead company.

COPPER CHIEF MINING CO. **WASHINGTON.**

Said to own 4 claims near Mineral City, Washington.

COPPER CLIFF MINES OF MONTANA, LTD. **MONTANA.**

Offices: 727-733, Salisbury House, London, E. C., Eng. Registered September 11, 1903, with capital, nominal, £2,000,000, for purpose of developing mines in Montana.

COPPER CLIFF MINING CO. **ARIZONA.**

Property sold to the Catalina Mining Co.

COPPER CLIFF MINING CO. **MONTANA.**

Office and mine: Cliff, Powell Co., Mont. Idle. W. P. Shipler, superintendent. Lands, 4 claims, area 80 acres, showing contact veins of good width, with oxide, carbonate and sulphide ores, said to assay 10% copper and $10 gold per ton. Has tunnels of 300′, 500′ and 800′, and a 200′ shaft. Said to be under bond to Baltimore parties.

COPPER CLIFF MINING CO. **SOUTH DAKOTA.**

Office: 79 Dearborn St., Chicago, Ill. Mine office; Rochford, Pennington Co., S. D. Organized 1899, under laws of South Dakota, with capitalization $1,000,000, shares $1 par. D. F. Brazee, president; Chas. A. Fohrman, vice-president and general manager; E. W. Eldridge, secretary. Property, carrying copper ore and graphite, is opened by 350′ tunnel. Company is mining graphite and making paint therefrom in a suburb of Chicago.

COPPER COBRE MINING CO. **ARIZONA.**

Letter returned unclaimed from former office, 25 Broad St., New York. Mine office: Prescott, Yavapai Co., Ariz. G. W. Middleton, superintendent. Organized 1901, under laws of New Jersey, with capitalization $1,000,000, shares $1 par. Lands, in the Bradshaw mountains of Yavapai county, are developed by a 900′ tunnel showing auriferous and argentiferous copper ores.

COPPER COMPANY OF BRITISH COLUMBIA, LTD. **BRITISH COLUMBI**

Offices: 11, Grocers' Hall Ct., London, E. C., Eng. Was formed t acquire copper mines in the Kootenai district, British Columbia. No return secured, and company apparently moribund.

COPPER CONTACT MINE. **NEVADA.**

Mine office: Sodaville, Esmerelda Co., Nev. Owned by A. F. Bettles, J. D. Thompson and W. R. Smith, of Salt Lake City, Utah.

COPPER CORPORATION OF CHILE, LTD. **CHILE.**

In voluntary liquidation; J. Peters, St. George's House, Eastcheap, London, E. C., Eng., liquidator. Las Animas mines of this company have been sold to Las Animas Copper Mining & Smelting Co., Ltd., for £3,000 cash and £54,500 debentures.

COPPER CREEK CONSOLIDATED CO. **ARIZONA.**

Letter returned unclaimed from Prescott, Yavapai Co., Ariz. R. H. Burmister, president; John Roberts, superintendent, at last accounts.

COPPER CREEK MINING CO. **CALIFORNIA.**

Letter returned unclaimed from Fresno, Fresno Co., Cal. Organized 1903, to develop sundry copper claims in the mountains east of Fresno.

COPPER CROWN MINING CO. **MICHIGAN.**

Office: 616 North Broadway, St. Louis, Mo. Mine office: Matchwood, Ontonagon Co., Mich. Employs 8 to 10 men. Capitalization $2,500,000, shares $25 par, said to be non-assessable. Dr. M. J. Hopkins, president; H. J. Mulholland, general manager; W R. Hopkins, secretary; J. F. Finnegan, superintendent. Lands are said by company to be 1,320 acres, and include the Hamilton group of 400 acres, this being composed of the Hamilton, Trap Rock, Essex and Windsor properties, old attempts at copper mines made in the early days of Lake Superior development. Openings are a 100 shaft on the Meads vein, said to show a little copper, and a tunnel of several hundred feet in length showing nothing in particular. The company puts forth the following claims: "Five distinct veins of pure native copper ranging from 6′ to 10′ wide have been accurately located. These outcrop on the surface and can be easily traced and accurately located. * * * Experts say that beyond a doubt the Copper Crown possesses one of the richest ore bodies of virgin copper found in the Lake Superior district. That these native copper lodes extend for many miles into the earth is not a conjecture but an historical fact." Then follows an assay showing 75% metallic copper. Prospectus also says: "We court the fullest investigation. * * Will gladly answer any questions and furnish any information that you may desire," notwithstanding which the company entirely failed to furnish a report for the Copper Handbook, although repeatedly requested. The company also claims to have plans and specifications for a 500-ton stamp mill, and to have assets of $50,000 Assets are probably paper assets principally, and even if in cash would be insufficient to build the mill, while if the mill were built there is no mine to feed it The value of the property is uncertain, and it is not at all likely that the present management will ever prove any values there, unless it is realized that copper mines are not made so easily in the Lake Superior district as the prospectus of the company indicates.

COPPER CROWN OF ARIZONA MINING CO. **ARIZONA.**

Office: 13 South Seventh St., Minneapolis, Minn. Mine office: Pearce, Cochise Co., Ariz. Organized 1900, under laws of Arizona, with capitalization $2,000,000, shares $1 par. Thos. W. Stevens, president; C. F. Potter, Jr., secretary; Chas. F. Potter, general manager. Lands, 17 claims, area 340 acres, also a 20-acre millsite and 10-acre smelter site, in the Dragoon mountains, showing 3 veins giving assays of 5% to 40% copper, with small gold and silver values, from oxide, carbonate and sulphide ores. Has a 275′ shaft and two short tunnels, with about 1,000′ of underground openings.

COPPER CROWN OF NOVA SCOTIA MINING CO. **NOVA SCOTIA.**

Office: 373 Washington St., Boston, Mass. Organized under West Virginia laws, with capitalization $1,000,000, shares $1 par. Samuel K. Paige, president; Geo. B. Holden, secretary and treasurer; W. H. Kennan, manager. Lands, near Pictou, N. S., claimed to show extensive ore bodies averaging 5% to 6% copper. Has a smelter, with blast furnaces of 300 tons and reverberatory furnace of 70 tons daily capacity, located with tidewater in front and railroad tracks behind. Fuel and flux are abundant and cheap. Company is in litigation, with shareholders suing officers for alleged illegal acts.

COPPER DUKE MINE. **MONTANA.**

Claims near Copperopolis, Meagher County, Montana.

COPPER ESTATES OF WESTERN AUSTRALIA, LTD. **AUSTRALIA.**

Offices: 66, Finsbury Pavement, London, E. C., Eng. No returns secured from company, and no particulars regarding property obtained from Western Australia.

COPPER EXPLORERS, LTD.

A moribund English corporation.

COPPER FALLS MINE. **MICHIGAN.**

Once a dividend payer. Absorbed by Arnold, 1898. Fully described in Vol. I.

COPPERFIELD MINES. **VERMONT.**

Office: 820 Pennsylvania Ave., Pittsburg, Pa. Mine office: Copperfield, Orange Co., Vt. Geo. Westinghouse, Pittsburg, Pa., owner; Geo. J. Troop, Jr., general manager; Geo. C. Everett, mill superintendent; Wm. Ricker, mine superintendent. Property includes the old Ely and Copperfield mines, having a strong ore body carrying low-grade disseminated chalcopyrite. Main shaft, 3,700′, on an incline of 23°, giving a vertical depth equal to about 1,500′. Has a 1,000′ tunnel leading from 300′ level to mill. Has a combined mill and smelter, connected with mine by a gravity tram, having two water-jacket blast furnaces and one reverberatory furnace with one stand of converters installed in 1902, making blister copper of 98% to 99% tenor. Property was worked on a considerable scale previous to circa 1860, and was reopened by present owner in 1900. Employed about 200 men at last accounts.

COPPER FIELDS OF NAMAQUALAND, LTD. CAPE COLONY.

Offices: 10, St. Helen's Place, London, E. C., Eng. A. Crump, chairman; N. A. Eustace, secretary. Owns 354 acres of land in Little Namaqualand, Cape Colony, South Africa.

COPPER GIANT GOLD & COPPER MINING CO. WYOMING.

Office: Encampment, Carbon Co., Wyo. D. Frank Powell, president; P. H. Kennedy, secretary. Idle at last accounts.

COPPER GIANT MINING CO.

Office: Spokane, Wash. Wm. H. Ludden, president; L. B. Cornell, secretary. Organized 1897, under laws of Washington, with capitalization $1,000,000, shares $1 par. Company has 3 claims, with a fair showing of ore, but no money.

COPPER GLANCE MINING CO. ARIZONA.

Office and mine: Bisbee, Cochise Co., Ariz. Employs 25 men. S. W Clawson, president and treasurer; C. C. Warner, vice-president; A. S. Barker secretary; C. L. Beckwith, general manager; A. G. Watkins, superintendent Organized March, 1901, under laws of Arizona, with capitalization $2,500,00 shares $1 par. On Nov. 1, 1903, company had on hand $20,814.82 cash, wit assets of $53,587.44 exclusive of mine, and was without indebtedness. Annu meeting, March 9. Lands, 24 patented claims, area 480 acres, in the Warr district, about 9 miles southeast of Bisbee. Has shafts of 50′, 100′, 140′ ar 560′ with tunnels of 75′ and 150′. The entire holdings of the company a capped by a thick bed of conglomerate, which has been penetrated at o point only, at a depth of 505′, in the main shaft. This conglomerate, whi is first noted in the gulch opposite the Copper Queen mine at Bisbee, app ently increases in thickness to the southeastward. On the Glance prope the entire capping is a low-grade copper ore, carrying malachite and chal cite disseminated throughout, with occasional occurrences of massive chal cite up to several pounds weight. The tenor of the conglomerate as a wh is too low to permit of profitable extraction, but in an hour's inspectio this conglomerate on the Copper Glance lands I was unable to find a si spot where the rock in place did not show more or less ore. While the glomerate is too low in grade to be worked, the showing made by it is of a nature that the company is amply warranted in sinking to great dept the hope of finding paying ore bodies in the underlying limestone.

A heavy flow of water was met in the shaft at a depth of about 500′, an considerable time was lost in securing pumping machinery capable of carin for the inflow. The mine now has a 150-h. p. steam plant, with powerfu pumps and two hoists, good for depths of 1,500′ and 2,000′ respectively. Buildings include an engine-house, smithy and 6 dwellings. The mine is served by the El Paso & Southwestern Ry., which crosses the company's lands, and has a station a quarter mile from the mine. A diamond drill has been secured and will begin work early in 1904. The officers of this company are men of the very best standing, and have the advantage of twenty years experience in practical mining in the Warren district. While it is impossible for anyone to predict the outcome of the venture, the showing is an exceptionally good one, fully justifying the management in carrying out its extensive plans for the opening of the property.

COPPER GLANCE MINING CO. **NEW MEXICO.**

Mine office: Taos, Taos Co., N. M. Supposed to be idle.

COPPER GLANCE MINING & MILLING CO. **WYOMING.**

Mine office: Encampment, Carbon Co., Wyo. Geo. Garroutte, general manager, at last accounts.

COPPER GLOBE MINING CO. **UTAH.**

Claims in the southwestern part of Emery county, Utah. Title in dispute, at last accounts, between Dr. C. B. Snyder, of Provo, Utah, and Dr. W R. Rice, of St. George, Utah. Said to have large bodies of low-grade copper ore.

COPPER-GOLD MINING CO. **WASHINGTON.**

Mine office: Bossburg, Stevens Co., Wash. S. G. Wilson, superintendent, at last accounts. Ores carry copper and silver.

COPPER-GOLD MINING & MILLING CO. **WYOMING.**

Mine office: Hecla, Carbon Co., Wyo. Joseph O. Majors, superintendent.

COPPER HILL MINE. **ALABAMA.**

An idle property, near Stone Hill, Cleburne Co., Ala. Once known as the Woods mine. Opened 1870, closed 1879. Had a smelter and worked as many as 500 men. Closed owing to exhaustion of high-grade ores. Vein is 24′ wide, mineralized near walls to extent of 3% to 7% copper. Value of production secured was about $1,300,000.

COPPER HILL MINE. **CALIFORNIA.**

Owned by W. F. Detert, Jackson, Cal. Mine, in Amador Co., Cal., was opened, circa 1861, and worked about 20 years, with considerable production. Now idle. Vein formation, quartz porphyry, is 500′ to 600′ wide, with heavy gossan capping. Ore is chalcopyrite, associated with iron pyrites.

COPPER HILL MINING CO. **ARIZONA.**

Office: presumably Denver, but street number not obtained. Mine office: Oracle, Pinal Co., Ariz. Company said to contemplate installation of 100-ton leaching plant, and building of wagon road 24 miles to nearest railroad, at Red Rock Station, in order to transport ore by traction engine. Claimed to have a half million tons of low-grade carbonate and silicate ores opened in the mine.

COPPER HILL MINING CO. **NEW MEXICO.**

Dead. Lands sold November, 1903, to A. B. Renehan, for $7,600.

COPPER HILL MINING & MILLING CO. **WASHINGTON.**

Office: 504 Empire Bldg., Spokane, Wash. Organized 1899, with capitalization $75,000, shares 5c. par. F. J. Heller, president; G. O. Nettleton, secretary. Lands, 4 claims, area 80 acres, in the Newport district of Stevens county, Washington, with rail and water transportation easily accessible. Has a 230′ shaft and a 260′ tunnel, showing an 18′ vein carrying chalcopyrite in pyrrhotite.

COPPER INDEPENDENT CONSOLIDATED MINING CO. **WASHINGTON.**

Office: 61 Court St., Boston, Mass. Mine office: Silverton, Snohomish

Co., Wash. M. V. Little, president; E. P. Crooker, secretary; Arthur W. Hawks, general manager. Capitalization $3,000,000, shares $1 par. Lands are two groups of claims, also several millsites. Has 5 tunnels, longest 1,200', with several thousand feet of underground development, on a fissure vein in granite. Plant includes a 300-ton concentrator, 52x133', of wood, equipped with crushers, rolls and tables, producing about 25 tons daily. A turbine develops 550 h. p. from the Stilaguamish river. Company pays 6% annually on stock issued, and property seems of considerable promise.

COPPER KING MINE. ARIZONA.

Office and mine: care of Peter Johnson, owner, Bisbee, Cochise Co., Ariz. This is the original property held by the Copper King of Arizona, but was abandoned several years ago, and recently relocated by the present owner. Has a 625' shaft, in porphyry, which has cut a number of small stringers of copper ore. Property was generally regarded as worthless, until very recently, but developments on the Junction property indicate the possibility of considerable ore bodies underlying the porphyry, near its junction with the limestone, in the Warren district.

COPPER KING MINE. ARIZONA.

Mine office: Johnson, Cochise Co., Ariz. S. A. D. Upton, owner. A prospect having a limited amount of development work.

COPPER KING CLAIMS. BRITISH COLUMBIA.

Mine office: Kamloops, Yale & Cariboo district, B. C. Is working a small force, and made first shipment of one car-load of slightly auriferous copper ore to the Crofton smelter in October, 1903.

COPPER KING CLAIMS. BRITISH COLUMBIA.

A prospect located 16 miles west of Kamloops, B. C., which has given assays of 5% to 20% copper, 1 to 6 oz. silver and $10 to $20 gold per ton.

COPPER KING GROUP. BRITISH COLUMBIA.

Six claims near the Queen Victoria property, at Beasley, 7 miles west of Nelson, B. C. Shows several exposures of sulphide ore. Has gravel overburden, rich in float ore.

COPPER KING GROUP. COLORADO.

Eleven claims on Middle Mountain, about 13 miles from Twin Lakes, Colo., owned by James Harrison, et al. Formation, micaceous granite, with porphyry dykes. Principal vein is a fissure 20' wide, with 1' pay streak on hanging wall, carrying good assay values in copper, silver and gold. Has a limited amount of development, by tunnels.

COPPER KING MINE. COLORADO.

Mine office: Turret, Chaffee, Co., Colo.

COPPER KING MINE. OREGON.

Supposed to be located in vicinity of Comer, Grant Co., Ore.

COPPER KING MINE. SOUTH DAKOTA.

Claims in the vicinity of Terry, Lawrence Co., S. D.

COPPER KING MINE. WASHINGTON.

Mine office: Chewelah, Stevens Co., Wash. Employed a small force in prospecting work at last accounts.

COPPER KING MINE. **WYOMING.**

Mine office: Tie Siding, Carbon Co., Wyo. W. C. Lynde, superintendent. Said to have been sold to Messrs. Martin & Lambert, of Chicago, for $30,000, and that new owners purpose installing steam plant for development.

COPPER KING, LTD. **CALIFORNIA.**

An English company having mining property at Letcher, Fresno Co., Cal., which became bankrupt through extravagant management. Fully described in Vol. III.

COPPER KING CONSOLIDATED MINING CO. **COLORADO.**

Incorporated April, 1903, by Milo A. Smith, et al, with capitalization $300,000, to operate in Jefferson and Clark counties, Colorado.

COPPER KING MINING CO. **BRITISH COLUMBIA.**

Mine office: Cameron Lake, Nanaimo district, B. C. Has a 100′ tunnel, showing copper ore.

COPPER KING MINING CO. **COLORADO.**

Mine office: Pearl, Larimer Co., Colo. P. B. Coolidge, superintendent. Has auriferous and argentiferous copper ores, and was developing with a force of about 20 men at last accounts.

COPPER KING MINING CO. **IDAHO.**

Office and mine: Shoup, Lemhi Co., Idaho. Is a limited partnership and employs 2 men. Lands, 11 claims, area 220 acres, also 260 acres miscellaneous lands, in the Mackinaw district, showing numerous fissure veins in quartzite, of which three, with average width of 10′ to 12′, are opened by 2 shallow shafts and 7 tunnels, of which 3 are 300′ each in length, showing cuprite and malachite giving average assays of 7% copper, 1 oz. to 4 oz. silver and $1 to $3 gold per ton. Has about 100 tons of ore averaging 15% copper on the dump.

COPPER KING MINING CO. **MONTANA.**

Has property in the vicinity of Missoula, Missoula Co., Mont., assessed at $2,600 in 1902.

COPPER KING MINING CO. **OREGON.**

Incorporated, August, 1902, with capitalization $1,500,000. Letter addressed to Pendleton, Ore., where company was organized, returned unclaimed.

COPPER KING MINING CO. **UTAH.**

Dead. Lands sold to Consolidated Mining & Smelting Co.

COPPER KING MINING CO. **WASHINGTON.**

Mine office: Sumas, Whatcom Co., Wash. R. S. Lambert, superintendent, at last accounts.

COPPER KING MINING CO. **WYOMING.**

Supposed to have claims somewhere in Carbon county, Wyoming. Letter addressed to Rawlins, Wyo., returned unclaimed.

COPPER KING MINING & MILLING CO. **WASHINGTON.**

Organized under laws of Washington in 1898, with Geo. R. Trask, president, and Sam Hanauer, secretary. No trace of company's lands or present office found after protracted investigation.

COPPER KING MINING & MILLING CO., LTD. **IDAHO.**

Office: Kellogg, Idaho. Mine office: Pollock, Idaho Co., Idaho. Chas. McKinnis, president and general manager; Y. Craik, secretary and treasurer. Organized March 22, 1901, under laws of Idaho, with capitalization $62,500, shares 5c. par. Lands, 6 claims, area 120 acres, well timbered, with available water power, in the Rapid River division of the Seven Devils district, showing 2 fissure veins in phonolite, of which one of 8′ width is opened by a 265′ tunnel showing bornite and chalcopyrite giving good assays in copper, silver and gold.

COPPER KING MINING & SMELTING CO. **IDAHO.**

Supposed to have claims in the vicinity of Mullan, Shoshone Co., Idaho.

COPPER KING MINING SYNDICATE. **WASHINGTON.**

Office: Tacoma, Wash. R. E. McFarlane, president; E. Areith, secretary and treasurer; D. E. Guiley, superintendent. Capitalized at $10,000,000. Lands, 64 claims, in Pearce county, Washington. Company has recently acquired the old Eastlick mine, said to have produced some very high-grade ore, and opened by a 130′ crosscut tunnel, with a small amount of drifting. District said to be rich, but not easily accessible.

COPPER KING OF ARIZONA MINING CO. **ARIZONA.**

Office: 116 Nassau St., New York. Mine office: Pearce, Cochise Co., Ariz. Elisha Boitel, president; Thos. F. Gaynor, secretary and treasurer; Thos. F. O'Brien, superintendent. Organized 1895, with capitalization $5,000,000, shares $1 par. Stock was peddled assiduously by the late B. C. Davis and his successor, Gaynor, both making large promises, none of which were redeemed. Operations were begun at Bisbee, transferred therefrom to Solomon Springs, thence to Barrett, and latterly at Pearce, all in Cochise county, Arizona. A new corporation called "The Copper King of Arizona" was incorporated in 1903 under the laws of West Virginia by Messrs. Boitel, Hess and Brunton, presumably to take over the affairs of the Copper King of Arizona Mining Co. Management of the company was scandalously bad for many years, but seems to have improved somewhat since Mr. Boitel's election to the presidency, but financial affairs of company are not on a favorable footing at present.

COPPER KNOB MINING CO. **NORTH CAROLINA.**

Said to have been merged in the Blue Ridge Copper Mining Co. Mine is at Gap Creek, Ashe Co., N. C. Said to have a 1′ fissure vein, and is 30 miles from a railroad. Ores are of considerable variety and carry good gold values.

COPPER MINES OF MOUNT LYELL WEST, LTD. **TASMANIA.**

Offices: 16, St. Helen's Pl., London, E. C., Eng. Mine office: Gormanston, Montague Co., Tasmania. Chas. McCulloch, chairman; A. G. Ogilvie, mine manager; Herbert A. H. Russell, secretary. Organized 1897, under laws of Tasmania, with authorized capital of £400,000; issued, £230,000. Lands, 8 leases, area 80 acres, adjoining the Mt. Lyell Mining & Railway Co., and showing several wide ore bodies, assaying 3% to 7% copper with small gold and silver values. Development is by 2 tunnels. Is not yet a producer.

COPPER MOUNTAIN DEVELOPMENT CO. CALIFORNIA.

J. B. Campbell, president; R. McCourt, superintendent. Has 50 claims, area about 1,000 acres, 35 miles east of Kaweah, Tulare Co., Cal. Mines opened July, 1900. Ores are carbonates and sulphides, carrying 2% to 25% copper. Has a limited amount of development work.

COPPER MOUNTAIN MINING CO. CALIFORNIA.

Office: 310 Laughlin Bldg., Los Angeles, Cal. Mine office: Victor, San Bernardino Co., Cal. W. A. Cooper, president; J. S. Longley, secretary; J. A. Morlan, manager. Lands, 10 claims, including the Amazon mine, showing a 200′ gossan outcrop, opened circa 1873, reopened 1901. Main shaft, 200′, showing sulphide ores, assaying 8% to 10% copper, with about 10,000 tons of ore on the dump.

COPPER MOUNTAIN MINING CO. NEVADA.

Mine office: Tacoma, Elko Co., Nev. D. Kane, superintendent. Has steam power, and was developing, with small force, at last accounts.

COPPER MOUNTAIN MINING CO. WYOMING.

Office: Care of Dr. C. W. Long, manager, Denver, Colo. Has claims on Copper Mountain, 20 miles southeast of Big Horn, Wyo., said to show a 6″ vein of ore, assaying 40% copper, 517 oz. silver and $15 gold per ton.

COPPER MOUNTAIN MINING & DEVELOPMENT CO. WASHINGTON & BRITISH COLUMBIA.

Office: 5406 Union Ave., South Tacoma, Wash. Lands are in Washington and British Columbia. Capitalization $200,000, shares 10c. par. S. B. Cowles, president; Jos. Hutchinson, secretary; B. D. Holcomb, general manager; A. T. Macaulay, superintendent. The property at Ryan, Stevens Co., Wash., is idle. This has 4 claims, area 90 acres, with 3 ore bodies, one lens 75′ wide being opened by a 300′ shaft and 115′ tunnel. The property at Quatsino Sound, B. C., employs about 10 men. Lands, 5 claims, area 258 acres, showing an ore body said to be 100′ wide, with measured length of 3,000′, giving assays of 6% to 8% copper, 3 oz. silver and $2 gold per ton from chalcopyrite. A large amount of ore is shown in surface, and the deposit is worked open-cast. A shaft may be sunk later. Ore will be treated by the new smelter of the Yreka Copper Company, 7 miles distant. Property is considered promising.

COPPER MOUNTAIN MINING & MILLING CO. UTAH.

Office: 323 D. F. Walker Bldg., Salt Lake City, Utah. Mine office: Milford, Beaver Co., Utah. Lafayette Holbrook, president; Benj. T. Lloyd secretary and manager. Capitalization $80,000, shares, 10c. par. Lands, 6 claims, having open-cuts and shallow shafts of 5′ to 60′, and a main shaft, of peculiar construction, about 250′ in depth, showing an iron ore vein of 4′ to 14′ width, giving assays of 18% to 28% copper. Shaft is vertical for about 100′; thence drops 100′ at an angle of 75°; thereafter has 50′ sunk at an angle of 70°. If present plan of opening be continued, shaft will eventually emerge to surface. Has gasoline power.

COPPEROPOLIS MINE. ARIZONA.

Office: care of Dr. J. M. Ford. Phœnix, Ariz. Mine office: Briggs, Yavapai Co., Ariz. Emery W. Fisher, superintendent. Ores carry copper, silver and lead. Has gasoline power and employs about 20 men.

COPPEROPOLIS MINE. MONTANA.

Mine office: Copperopolis, Meagher Co., Mont. An old property, which has produced considerable copper in the past, but has never been a financial success. Idle at last accounts. Owned by Daly Mining Co., of Butte, Mont.

COPPEROPOLIS MINE. OREGON.

Office: 538 Chamber of Commerce, Portland, Ore. Mine office: Quartzburg, Grant Co., Ore. Employs 10 men. Organized 1900, under laws of Oregon, with capitalization $120,000, shares 10c. par. A. H. Willett, president; W. W. Gibbs, secretary, treasurer and general manager. Lands, 2 patented claims, area 40 acres, also 5-acre mill site, showing 4 fissure veins with estimated average values of 12% copper, $15 gold and 3 oz. silver per ton, from carbonate and sulphide ores. Has tunnels of 75′ and 400′, with steam, water and electric power.

COPPEROSITY MINE. ARIZONA.

Mine office: Vekol, Pinal Co., Ariz. E J. Bonsall, superintendent, at last accounts.

COPPER OXIDE GROUP. ARIZONA.

Mine office: care of W. H. Baker, P. O. Box 147, Bisbee, Cochise Co., Ariz. A group of 27 claims, located in Tombstone Canyon, about 6 miles northwest of Bisbee, on which assessment work has shown an iron outcrop.

COPPER PRINCE GROUP. ARIZONA.

A group of claims in the Eureka district of Yavapai county, Arizona. Colin Timmons, superintendent, at last accounts.

COPPER PRINCE MINE. ARIZONA.

Mine office: Kingman, Mohave Co., Ariz. J. W. Smith, superintendent. Has gas power. Probably a gold mine only, as this section of Mohave county is not known to show copper.

COPPER PRINCE MINING CO. CALIFORNIA.

Mine office: Middletown, Lake Co., Cal. E. Lobree, president; J. C. Ruddock, secretary, Ukiah, Cal. Lands, 3 claims, opened by tunnel and trenches. Vein 6′, to 8′, in limestone, giving assays of 5% copper, $3 gold and 1 oz. silver per ton.

COPPER QUEEN CLAIMS. ARIZONA.

Mine office: Stoddard, Yavapai Co., Ariz. Have ore carrying copper and gold values, opened by tunnel.

COPPER QUEEN GROUP. ARIZONA.

Mine office: Riverside, Pinal Co., Ariz. A group of rather promising claims, near the Ray, now idle.

COPPER QUEEN MINE. CALIFORNIA.

B. F. Rogers, superintendent. Is in the Pit River district of Shasta county, California, and is opened by a 350′ tunnel.

COPPER QUEEN GROUP. IDAHO.

Twelve claims in the Blackbird district of Lemhi county, Idaho, claimed to show an 8′ vein assaying 27% copper and $8 gold per ton.

COPPER QUEEN MINE. **MONTANA.**

Office: care of Geo. G. Lynch, owner, Dillon, Mont. J. H. Burnett, operator under lease. Is in Beaverhead county, Montana, near the Idaho line. Has shipped ore yielding 30% copper, 30 oz. silver and $14 gold per ton.

COPPER QUEEN, LTD. **BRITISH COLUMBIA.**

Offices: 17, Basinghall St., London, E. C., Eng. A. G. Smith, chairman; F. G. Walter, secretary. Capital, nominal, £10,000; issued, £1,403. Abandoned the original property, the Copper Queen Group at Nelson, B. C., and invested resources in 1,200 shares of the Bosun Mines, Ltd.

COPPER QUEEN CONSOLIDATED MINING CO. **ARIZONA.**

Office: 99 John St., New York. Mine office: Bisbee, Cochise Co., Ariz. Employs 2,000 men, about half underground and half on surface, which force will be largely increased in the near future. Is sixth among the world's great copper producers, with an exceptionally bright future. Organized 1884, under laws of New York, with capitalization $2,000,000. James Douglas, president; Geo. Notman, secretary and treasurer; Walter Douglas, general manager; S. W. French, assistant manager; S. W. Clawson, mine superintendent; C. C. Warner, assistant mine superintendent; Geo. B. Lee, smelter superintendent; W. F. Crane, chief auditor. Has upwards of 1,000 acres of mineral lands, great value of much of the undeveloped territory having been established recently by operations of adjoining companies. Mine was opened in 1880, on a solid outcrop of oxidized copper, iron and manganese, opposite the Copper Queen hotel in Bisbee. This entire ore body has been removed, leaving a large artificial cave. The original ore body gave average returns of 23% copper and was smelted in a 30″ water-jacket furnace with English coke brought via San Francisco. The first ore body was exhausted in three or four years, and the mine had many ups and downs, until additional and far larger ore bodies were developed by following seams and stringers of ore wherever occurring, these almost invariably leading to further large and rich ore deposits. The formation of the Copper Queen and other mines of the district consists essentially of two dolomitic limestone beds of Carboniferous age, the upper white and the lower blue, dipping to the southward and flanking a granite-porphyry core, with intrusive porphyritic horses. Until recently the principal ore bodies have been found at the base of the upper limestone bed, which is much broken and interrupted by feldspathic, igneous, intrusive rocks that evidently have a considerable bearing upon the ore deposits, which occur in pockets, lenses, chimneys, bunches, chutes, veins, stringers, seams—in fact in almost every manner possible, the larger bodies being connected in most cases by small veins or mere knifeblade seams. The limestone and its included ore bodies have a general pitch to the southeast, somewhat sharper than the pitch of Tombstone Canyon, necessitating deeper and deeper shafts as distance is made toward the southeast. In 1902 extensive bodies of high-grade ore were found in the underlying limestone strata, and developments at the Calumet & Arizona mine proved these underlying ore bodies to be persistent to great depth. All of the Copper Queen's deep shafts are bottomed in disseminated sulphide ores of high grade, consequently the depth of the ore bodies, while already proven to be great, is conjectural. The mines show numerous beautiful caves lined with calcite, some of these being of considerable size and frequently found in close association with good ore bodies. The alteration zone is variable and erratic, as rich oxidized ores have been found on the lowest level, with chalcocite and bornite occurring above azurite, malachite, cuprite and even considerable bodies of native copper. The larger masses of native metal, ranging up to several hundredweights and even tons in weight, have been found mainly, not in the upper levels, as might have been expected, but at considerable depth. There is much talc and hematite, with frequent occurrences of manganese, in connection with ore bodies. Only oxidized ores were worked until about 1893, when converters were added to the smelting plant, since which time the furnaces are charged with mixtures of oxide, carbonate and sulphide ores, perhaps one-third of the charges being sulphide ores, the ores smelted giving average returns of better than 7%. The system of assaying used by the mine gives no figures regarding ores richer than 15% and the frequent occurrence of the figure "15+" on the assay books of every shaft testifies to the wonderful richness of the ore bodies.

The various shafts of the mine range from 400′ to 1,200′ in depth, and the mine has upwards of 135 miles of underground openings. There are three producing shafts, these being the Czar, Holbrook and Spray, with two developing shafts, the Lowell and Gardner, and one shaft, the White Tail Deer, under lease, with a number of old and small exploratory shafts and pits. The mine is opened ahead for perhaps eight or ten years, and during the past two years the bulk of the ore smelted has come from development work only, the present ore reserves of this property being among the richest and most extensive ever developed. The ores are so soft that securing the mine openings is a serious problem, as the entire hill above the mine is creeping, and serious crushes can be avoided only by heavy timbering and the exercise of great care. Many of the lower stopes are bulkheaded throughout. The mine is timbered with 10x10″ and 12x12″ square sets, mainly of Washington fir, and an average of 30′ of timber, board measure, is required for each ton of ore won. All ore is hand-sorted underground after breaking, and culls used for filling in worked-out stopes, this material standing remarkably well. That the Copper Queen mine, operated under these numerous disadvantages and menaces to life, is one of the safest copper mines in existence for underground workmen, is a proof of the zeal, experience and ability of its management.

The Czar shaft is the oldest of the present workings and the smelter and principal shops are found clustered about this shaft, on a narrow bench of ground made by grading the steep hillside. This shaft is connected underground with the Holbrook, Spray and Gardner shafts. The plant is crowded and apparently inadequate, notwithstanding which it has earned many millions for the Copper Queen company in the past, and is still doing much better work than its appearance promises. Next southeast of the Czar is the Holbrook shaft, an old and reliable producer carrying very rich ores, and excessively hot in the lower levels.

Next southeast is the Silver Spray, commonly known as the Spray, the newest of the mine's producing shafts. This is 950′ deep and has three compartments, two compartments carrying 3-deck cages for ore cars, with a man-cage and pipes in the third compartment. The pump station is on the 700′ level. The mine shows rich ores from the fourth level to the bottom of the shaft, the upper workings carrying mainly chalcocite, which changes to bornite on the fifth level, with carbonates, oxides and a continuance of sulphide ores shown on the sixth level, both oxidized and sulphide ores occurring on the seventh, and with mainly sulphide ores on the eighth level. The ore bodies are very extensive and persistent, but most erratic in nature, with frequent occurrence of porphyry dykes. A considerable body of native copper was recently cut on the 700′ level, and has again come in on the 800′ level, thus setting at defiance some deeply cherished geological theories regarding ore deposition.

Next southeast of the Spray shaft is the Irish Mag claim of the Calumet & Arizona, then a single 600′ claim of the Copper Queen, followed by the Senator claim of the Calumet & Arizona, which in turn is succeeded by the Lowell property of the Copper Queen, bought in 1901. The Lowell shaft is the deepest of the Queen's openings, being down 1,200′, with a pump station and Prescott pump at a depth of 1,000′. The ore is mainly sulphide and the showing of ore secured is among the best ever obtained in even this remarkably rich mine. The Czar, Holbrook, Spray and Lowell shafts all have railroad connections.

The Gardner shaft is something of an experiment, but results to date are encouraging. This is an old and shallow shaft, cut down in 1903 to 3-compartment size, by upraising. The shaft is near the porphyry contact and has a good sinking plant, with steam power and air compressor.

The White Tail Deer shaft is some distance south of the company's main workings, and reached by road only by a detour of several miles. This was opened circa 1893 by an incline shaft of 100′ and a drift was sent to the line of the Broken Promise claim, now owned by the Wolverine & Arizona, this drift showing good ore. The product was hauled to the smelter by a traction engine and about $300,000 worth of ore was taken out when work was suspended owing to lack of railroad facilities and the comparative inaccessibility of this shaft, with more ore developed right at the smelter than the furnaces could handle. The White Tail Deer was leased, late in 1903, and the lessees have reopened the old incline and are following a vein of high-grade ore, while the property also shows a big body of low-grade ore.

A little development work was undertaken in 1903 on the Hendricks claim, in the extreme northwestern part of the Copper Queen holdings, near the Higgins property. In addition to the working and development shafts previously enumerated there are many old prospecting shafts, pits and trenches, on the various undeveloped claims owned by the company.

The Copper Queen has 32 boilers at the mine and smelter. Fuel is principally Texas and California petroleum, consumption amounting to about 13,000 gallons daily, with about 100 tons of coke burned daily in the smelters. Petroleum has proven cheaper in initial cost and cleaner and easier for handling than coal, in addition to which a large saving is effected in the number of stokers required.

The old smelter at the Czar shaft reduces about 800 tons of ore daily, the sulphide and oxidized ores being mixed in proportions to give a self-fluxing charge. The plant has 5 steel water-jacket blast furnaces, 42"x120" each at the tuyeres, using a blast pressure of 7 lbs. per inch and turning out matte of 45% in tenor, which flows into settling wells with a continuous discharge of slag. The slags average about 34% silica, 45% iron and 18% alumina. Owing to the considerable copper values carried therein, it is possible that the two monstrous slag-dumps at Bisbee may be broken up and resmelted at the new Douglas plant. Flue dust is briquetted and recharged, while a portion of the sulphide ores is calcined in a Douglas roaster. The furnaces are oval, water-jacketed cupolas, with two tilting-wells set tandem, slag flowing from the second well into 2-ton ladles, thence to 4-ton slag cars drawn to the slag dump by a small locomotive. Converters are of the well-known Copper Queen horizontal barrel type, 5'6" in diameter by 8' in length. The product of the converters is turned out as blister copper averaging 99.3% in tenor, with small gold and silver values.

The Douglas Reduction Works are 28 miles from the mine and within a mile of the Mexican border. This magnificent new plant is designed as the central smelter for the mines of Phelps, Dodge & Co. in Arizona and Mexico, these including the Copper Queen at Bisbee, the Detroit at Morenci, the United Globe and Old Dominion at Globe, the Moctezuma at Nacosari, Sonora, and the Sierra de Cobre at La Cananea, Sonora, Mexico. As these six properties produce a great diversity of copper ores, including practically every grade and character found in the southwest and in northern Mexico, it will be possible by means of this central reduction plant to take the fullest advantage of the varied nature of the ores to mix the furnace charges advantageously. This plant will also take custom ores of copper, gold and silver, as well as caring for the increased tonnage of the Copper Queen. The company plans to enrich its copper bullion with gold and silver, mainly from Mexican ores, but does not intend to invade the lead market.

The new smelting plant at Douglas is entirely of steel, the principal buildings having the following dimensions: furnace building, 150x396'; power house, 110x250'; machine shop, 80x204'; boiler house, 45x208'; boiler shop, 80x120', and foundry, 60x80'. The smelter will have 5 furnaces, each 42x204', with capacity of about 500 tons daily, giving the plant a nominal daily capacity of 2,500 tons, but in actual practice it is probable that there will rarely be more than four furnaces in blast simultaneously. Each furnace will have a separate settler and a separate Connersville blower for blast. A standard-gauge railroad with dump-cars will care for the slag. The dust-chamber is of brick. Molten matte will be taken from furnaces to the converters by two 60-ton electric traveling cranes, each having two 15-ton auxiliary hoists.

There will be four stands of converters, with monstrous shells of the Copper Queen type, each 8′x11′6″. Blast for the converters will be furnished by 4 Nordberg air compressors, one for each stand, these being cross-compound, duplex condensing compressors with 30″ cylinders and 42″ stroke. The converter department is supplied with a silica mill and briquetting plant.

The boiler house has six 500-h. p. Stirling water-tube boilers, and a Green fuel economizer, with a brick stack 177′ high and 13′ in diameter surmounted by 4 lightning rods. The boilers are arranged to burn either coal or petroleum, but the latter will probably be used almost exclusively. The power plant is supplied with 13 engines of various sizes, types and uses, with an aggregate of 4,000 h. p. The electric plant has four 250-volt 400-kw. direct-current electric generators, supplying power for the traveling cranes, motors, slag-locomotives and electric lighting. The machine shop is fully equipped with modern tools and the boiler shop is designed to turn out work of the heaviest nature, and, if necessary, the plant is capable of overhauling and repairing locomotives. The smithy in connection with the boiler shop is also supplied with the best in equipment.

Adjoining the mine buildings is a steel trestle 48′ in height and 1,343′ long, this being divided into sections with bins for coke, fluxes and silica. Near this trestle are three ore pits, each 12′ deep, 38′ wide and 765′ long, lined with white tufa from a nearby quarry, with railroad tracks alongside. Ore will be dumped from trains and removed from the pits as needed by a steam shovel. These pits have a storage capacity of 10,000 tons each. There are larger smelting plants than the Douglas Reduction Works, although their number is few, but it is safe to say that when this plant is put in commission it will be the most modern of any in the world, and should give the best of results. Much delay has been experienced in securing material for the works, which were planned to be in use in 1903, but cannot go into commission before the spring or summer of 1904.

The El Paso & Southwestern railroad, which serves the Copper Queen, was built by Phelps, Dodge & Co., owners of the mine. This railroad has some 300 miles of main line, with considerable trackage in spurs and sidings, and while it was designed solely as an outlet for the Phelps-Dodge mines, it has developed a previously inaccessible district, rich in natural resources, and its business has increased in a manner astonishing to even the most optimistic. One result of the construction of this line is the building of the new town of Douglas, named in deserved honor of Prof. James Douglas, a bustling young metropolis of some 5,000 souls, apparently destined to become in the near future a strong competitor of El Paso as a smelting point for the ores of Arizona, New Mexico, Sonora and Chihuahua.

Among the miscellaneous enterprises of the Copper Queen is a sawmill in the Chiricahua mountains and an enormous department store which carries a stock and does a business that would do credit to any city of ten times the population of Bisbee. There is, however, no compulsion of employes, who are at perfect liberty to buy their goods at any of the numerous independent mercantile establishments. The company maintains a large library and read-par value $100. Has upwards of 1,000 shareholders. Wm. A. Paine, pr ident; Frederic Stanwood, secretary and treasurer; Cameron Currie, R. McKeever, Frederic Stanwood, W. A. Paine, John Stanton, Saml. L. Smi J. Henry Brooks, Chas. H. Paine and Kenneth McLaren, directors; John Wagner, purchasing agent. The Copper Range Consolidated Co. is stric a securities holding corporation, its sole holdings consisting of stock intere in sundry subsidiary corporations. It controls practically the entire st issues of the Baltic Mining Co., Copper Range Co. and Copper Range R. Co., and about 96% of the stock issue of the Trimountain Mining Co., one-half the stock of the Champion Copper Co. and a large share interes the Michigan Smelting Co. The Baltic, Trimountain and Champion mi and the Michigan Smelting Co. are described elsewhere under their respec titles.

Official returns to the state of Michigan, as of date Jan. 1, 1903, disc the following figures

Amount cash paid in on capital stock	$1,549,700
Amount paid in by conveyance of property to company	750,000
Entire amount invested in real estate	1,294,944
Amount of personal estate	4,499,796
Amount of unsecured or floating debt	951,173
Amount due corporation	617,002

Included in the personal estate are 26,051 shares of Copper Range R road Co. and 50,000 shares of Champion Copper Co., also $616,617.75 of bi payable of the Copper Range railroad, which is owned by the Copper Ra Consolidated Co., representing money advanced for construction. The Cop Range Consolidated Co. owns about 96% of the share capital of the T mountain Mining Co. secured in 1903 in even exchange for Copper Ra Consolidated stock. The Trimountain company is supposed to have a float debt, which may or may not have been assumed by the Copper Range Co solidated. The holdings of the Copper Range Co. include 8,720 acres land on the mineral belt, south of the Baltic, from which tract one-half of t lands composing the Champion mine were set off, the other half being suppli by St. Mary's Mineral Land Co., the stock of the Champion Copper Co. bei equally divided between the parent corporations. The Copper Range lan comprise a compact tract in Town 54 North, Range 34 West and Town 5 North, Range 35 West, something more than 5,000 acres being located on th mineral belt. The company also holds an option on 2,000 acres of miner land owned by St. Mary's Canal Mineral Land Co., in the immediate neighborhood of its own holdings. Miscellaneous lands include 441 acres with nearly 4 miles frontage on Lake Superior, near the mouth of the Graveraet river, 3 miles southwest of the Champion mill at Freda, sufficient to give sites to four new stamp mills.

The Copper Range Railroad Co. was organized in 1899 with an authorized capital of $5,000,000, of which $2,605,100 had been issued at last accounts, this being owned entirely by the Copper Range Consolidated Co. There is also an authorized bond issue of $20,000 per mile of completed main line and $15,000 per mile of completed branch lines and side tracks, of which $1,410,000 of first mortgage 5% bonds were outstanding on Jan. 1, 1903. Directors of the Copper Range Railroad Co. are Wm. A. Paine, Saml. L. Smith, Cameron Currie, Frank McM. Stanton, Rufus R. Goodell, John H. Rice, Jas. H. Seager, Frederic Stanwood, and R. T. McKeever. R. T. McKeever is general manager. The railroad has 83 miles of line and represents a cash expenditure of about $3,500,000. For the year ending June 30, 1903, the line showed surplus earnings of $108,712, or about 4% on the outstanding capital stock, with gross earnings of about $500,000. For October, 1903, gross earnings were $49,275 and net earnings $22,183, interest charges being $14,437, leaving surplus earnings applicable to dividends of $13,745, or better than 6% on the outstanding capital stock issue. Surplus earnings for four months ending October, 1903, were $75,757, as compared with $48,790 for the corresponding four months in 1902, showing an increase of more than 50% in 1903. The Copper Range railroad runs 56 miles from Calumet to Mass City, Ontonagon county, Michigan. Producing mines on the line between Houghton and Mass City are the Atlantic, Baltic, Trimountain, Champion, Winona and Adventure. Connections are made with the D. S. S. & A. and the Mineral Range railroads at Houghton, and with the Chicago, Milwaukee & St. Paul railway at Mass City. The bulk of the railroad's business is rock transportation between the mines and mills served by the line, but the timber and fuel traffic is heavy and steadily increasing, while passenger traffic and general freight business have shown steady and surprisingly heavy growth. The district traversed by this railroad, settlement of which was made possible by the construction of the line, was practically a wilderness in 1899, but now has a population of 15,000 souls and produced upwards of 35,000,000 lbs. of copper in 1903. The railroad owns valuable and extensive water frontage on Portage Lake, in the western part of Houghton, and a half interest in the railroad bridge crossing Portage Lake. The water frontage is partly improved with large and well-built merchandise and coal wharves, substantial freight depots and a two-story stone and brick general office building. The coal wharf is supplied with the most modern hoists and devices for the economical and expeditious handling of bituminous coal. The roadbed of this line, which was very rough originally, has been improved year by year, until it now compares favorably with many of the leading trunk lines. Locomotives and rolling stock have been added, and the railroad has enjoyed a steady and symmetrical growth. The district tributary to this line is rich, not only in copper, but also in arable soil and standing timber, mainly hemlock and hardwoods, while a number of important towns are growing up about the leading mines.

Through its subsidiary mining corporations the Copper Range Consolidated Co. is now the second largest producer of copper in the Lake Superior district, and in 1904 should turn out from the Baltic and Trimountain mines and its half ownership of the Champion mine, upwards of 30,000,000 lbs. of copper, produced at a cost of 7.5c. to 8c. per lb. While the capitalization of the Copper Range Consolidated Co. is large, the holdings are very extensive and the value of its mining interests is second only to the Calumet & Hecla in the Lake Superior field. Dividends may be paid in 1904, but the best interests of the company might be served by cleaning up the rest of the floating indebtedness, adding sundry improvements and extensions to railroads, mines and mills, and accumulating a cash surplus. This policy would enable the company to begin 1905 absolutely free of debt, with a large cash surplus on hand and with railroads and mines earning large profits available for the declaration of regular semi-annual or quarterly dividends.

COPPER RIVER MINING CO. **ALASKA.**

Office: 1347-25 Broad St., New York. Capitalization $50,000,000. F. M. Bradshaw, president; F. C. Helm, secretary and treasurer; F. M. Bradshaw, F. C. Helm, Hon. W. F. Bay Stewart, Hon. Robt. Gwynne, Jr. and John Q. Denny, directors. Company reports that Hon. Ferd. W. Peck, of Chicago, will also be elected a director in 1904. Lands, 188 claims, area 2,360 acres, with 12 other claims, area 240 acres, reported by company as in litigation. Lands show bornite and chalcocite, with native copper occurring in sizes from flecks up to masses of several tons weight. Lands are located about 185 miles inland, by trail, from Valdez, Alaska, and are said to have plenty of wood and water, with coal in the vicinity. The timber is a sparse growth of spruce and cottonwood, and the coal is lignite. Properties claimed by this company include the Bonanza, Nicholai, Kinnecot and Jumbo groups. The Bonanza group, also claimed by the Alaska Copper Co., and Chittna Exploration Co., is the principal prospect, this giving an exceptional showing of copper ore. The Kinnecot group has 31 claims, 5 miles from the head waters of the Kinnecot riverl in the Kinnecot mountains. The Nicholai group, 7 claims, 7 miles from the Kinnecot, is said to show a fissure vein.

An engineer who reported on portions of this property for the company states that the ore bodies are contacts between lime and "michaloid," probably meaning thereby amygdaloid, or possibly some form of mica-schist, or mayhap some entirely new variety of hyperborean rock-form not yet generally known to scientists. The ore body of the Bonanza group stands up above surface, showing bornite with a strong iron capping, the ore outcropping under the iron cap. The "michaloid" discoverer estimates the Bonanza ore body as 50′ wide and 575′ long, and asserts that an average of 30 or 40 fair samples taken by him from this outcrop gave upwards of 40% copper, and that the entire ore body will average above 30% copper, with $10 to $12 gold and silver, and estimated that $10,000,000 to $15,000,000 worth of ore is in sight. The "michaloid" expert also states that he secured ores assaying 75% copper from a large sample of croppings from the Jumbo group, said to have a vein running 75′ wide in places.

This company has furnished exceedingly voluminous returns for the Copper Handbook, most of which had no especial bearing on the subject and were not sufficiently detailed to be of any particular value. Requests for specific information were met with polite evasions and the tenderance of a ready-made description of this property, highly laudatory in every way. The company even omitted to give its capitalization, which is believed, on credible authority, to be for the ridiculous sum of $50,000,000. As near as can be learned $40,000,000 worth of this stock was divided between four of the promoters, including the president and treasurer, with $10,000,000 set aside as a treasury reserve for sale to investors, in order to secure funds to develop the property. The company was unfortunate in having connected with it at an early stage some of the biggest liars ever successful in breaking into print. It is stated that the more notorious among these liars have been shipped. The literature put forth by the company is most alluring, and is also most misleading, being composed mainly of extracts from statements of government officials, mining engineers and other men of prominence, made regarding the Copper River country generally, but so cleverly patched out as to convey the impression, not stated in so many words, that all of these eminent personages are giving their flat endorsement to the Copper River Mining Co., which of course they are not doing. Furthermore, while the Bonanza group is unquestionably a property of extraordinary promise, the title of the Copper River Mining Co. to this property is extremely uncertain, and while the officers of the company bear down heavily upon the wonderful showing at the Bonanza group, they gloze over the matter of litigation and uncertainty of title with a few brief words. The explanation of the president of this company of the defect in titles is that certain of the employes made away with the location papers and sold them in New York; the statement of the other parties to the litigation is entirely different, being to the effect that the prospecting syndicate of 12 men who located these lands sold their titles to the Alaska Copper Co., after dickering unsuccessfully with Bradshaw, the president of the Copper River Mining Co.

The promoters of this company have been successful in interesting in this property, as shareholders, some men of very high standing, who will doubtless feel chagrined when they learn to what use their names have been put.

COPPER ROCK GOLD MINING & MILLING CO. **COLORADO.**

Office: 802 Wainwright Bldg., St. Louis, Mo. Mine office: Sunset, Boulder Co., Colo. Capitalization $1,500,000. H. Lee Servoss, president; Dan G. Kirshbaum, secretary and superintendeent. Lands, 60 acres, about 40 miles northwest of Denver. Has a shaft, 300′ deep at last accounts. Ores carry copper, gold and silver and have shown good assay values.

COPPER SELECTION SYNDICATE, LTD. **AUSTRALIA.**

Offices: 257, Winchester House, London, E. C., Eng. H. J. Dixon, secretary. Capital, nominal, £15,000. Holds sundry options on property of the Great Cobar Copper Mining Syndicate, Ltd.

COPPER STAR MINING CO. **COLORADO.**

Office: 60 State St., Boston, Mass. Mine office: Salida, Chaffee Co., Colo. Capitalization $500,000, shares $1 par. Eugene B. Estes, president; Edwin Wallace, secretary and general manager. Lands, about 180 acres. Company began paying dividends of 2 cents per share while selling stock at $1 per share. Company has probably gone the way that all corporations go when they sell stock and pay dividends simultaneously.

COPPER STATE MINING CO. **WYOMING.**

Letter returned unclaimed from former office, Encampment, Wyo.

COPPERTOWN MINING CO. **CALIFORNIA.**

Office: San Francisco, Cal. Mine office: Hornitos, Mariposa Co., Cal. C. H. Street, superintendent. Is developing La Victoria mine, which has 3 shafts, each of about 200′, also a 400′ tunnel. Employs about 20 men. Vein matter, 300′ to 600′ wide, is of schistose diabase, between grano-diorite walls, showing malachite, azurite, cuprite, bornite and tetrahedrite. Vein has a heavy gossan capping. All ores, including the gossan, are more or less auriferous. Was once a considerable producer, employing 300 men, circa 1865. Company contemplates installing a smelter.

COPPER VEIL MINING CO. **WASHINGTON.**

Said to have 52 claims, with 6 tunnels, longest 250′, in vicinity of Index, Snohomish Co., Wash., but letter to that address was returned unclaimed.

COPPER VENTURE SYNDICATE, LTD.

Offices: 10, St. Helen's Place, London, E. C., Eng. Cannot be found that company owns any copper property.

COPPER WORLD MINE. **NORTH CAROLINA.**

Located in the Virgilina district of Person county, North Carolina. Operated by Danville, Virginia, parties. Has two shafts, deepest 100′, in a vein of fair width, carrying chalcocite, oxide and carbonate ores, ranging 15% to 65% in copper tenor.

COPPER WORLD MINING & SMELTING CO. **WASHINGTON.**

Office: care of Jerome L. Drumheller, Spokane. Wash. Letter returned unclaimed from former mine office, Loomis, Okanogan Co., Wash. John Wentworth, superintendent. Organized 1903, with capitalization $3,000,000, shares $1 par. Said to have a large body of sulphide ore, giving good assay values.

COPPER ZONE MINING CO. **NEW MEXICO.**

Company was dispossessed of its lands, and is probably dead.

SOCIEDAD MINERA COQUIMBANA. **CHILE.**

Mine office: La Serena, Coquimbo, Chile. Property includes the Rosario, Socavon and other mines, supposed to be idle.

CORA-ROCK ISLAND MINING CO. **MONTANA.**

Mine office: Butte, Silver Bow Co., Mont. Is a subsidiary corporation to the United Copper Co., which holds 95% of the capital stock. Property is the Cora and Rock Island mines, producing about 10,000 tons of ore monthly. Main shaft, 1,200′, with best values below 1,000′, producing smelting ore rich in silver. Employs about 250 men.

CORBIN-WICKES COPPER MINING CO. **MONTANA.**

Proposed new title of Colorado Mining & Development Co.

CORDENERA MINE. **MEXICO.**

Mine office: Suaqui Grande, Sonora, Mex. W. S. Morrow, manager. Ores carry silver and copper. Has steam power and 5-stamp mill.

CORDILLERO MINING CO. **BRITISH COLUMBIA.**

Office: care of A. W. More, 332 Lumber Exchange, Seattle, Wash. Lands, 3 claims adjoining the Cornell mine, on Texada Island, B. C.

CORDOBA EXPLORATION CO., LTD. **SPAIN.**

Property now operated by Cerro Muriano Mines, Ltd.

CORNELIA COPPER CO. **ARIZONA.**

Office: 802 Fullerton Bldg., St. Louis, Mo. Mine office: Gila Bend, Pima Co., Ariz. Idle. W. R. Ramsey, president; John R. Boddie, secretary. Organized May 14, 1900, under laws of Arizona, with capitalization $100,000, shares $10 par. Has no cash on hand, and no liabilities. Lands, 6 patented claims, area 100 acres, developed by shafts of 125′ and 225′ and tunnels of 30′ and 60′. Has steam power.

CORNELL MINE. **BRITISH COLUMBIA.**

Operated by Van Anda Copper & Gold Mines Co.

CORNELL GOLD, SILVER & COPPER MINING CO. **NEW MEXICO.**

Mine office: Silver City, Grant Co., N. M. Frank F. Ross, secretary. Lands, including the Owl mine, are in the Gold Gulch district.

MINA EL CORNETA. **MEXICO.**

Mine office: San Miguel Mezquital, Zacatecas, Mex. Henry Winninghoff, owner. Was developing, with force of about 20 men, at last accounts.

CORNETT MINE. **CALIFORNIA.**

Owned by H. W. Cornett, Merced, Mariposa Co., Cal. Vein matter is schistose diabase, with 3′ pay-streak carrying ore, mainly chalcopyrite, assaying 17% to 23% copper, and $2.25 to $4.50 gold per ton. Was developing, with small force, at last accounts.

CORNISH COPPER CO.

Organized December, 1903, under laws of Connecticut, with capitalization $300,000, by Andrew B. Hardryx, et al, of New Haven, Conn.

CORNUCOPIA COPPER CO. **OREGON.**

Mine office: Quartzburg, Baker Co., Ore. Cannot be learned that property is working.

CORNUCOPIA GOLD & COPPER MINING CO. **ARIZONA.**

Mine office: Cherry, Yavapai Co., Ariz. E. R. Hotzenpiller, president and general manager.

CORNWALL COPPER MINES. **MISSOURI.**

Located in Ste. Genevieve county, Missouri, and were worked on a fair scale, circa 1860. Ores are greater in variety than in quantity, those found including cuprite, covellite, malachite, azurite, chalcocite, bornite, chalcopyrite, melaconite, chalcanthite and chrysocolla.

COMPANIA CORO CORO DE BOLIVIA **BOLIVIA.**

Mine office: Coro Coro, La Paz, Bolivia. This company works native copper occurring in beds of conglomerate, and is the largest producer of Bolivia, making yearly about 1,500 tons of mineral, averaging 85% fine copper. A little cuprite and chalcocite occur also, and silver, found with the copper in native form, as at the Lake Superior mines, is an important by-product. Has steam power and small smelter, employing several hundred men.

CORONA CONSOLIDATED GOLD & COPPER CO. ARIZONA.

Office: Union Blk., Prescott, Ariz. Organized under laws of Arizona, with capitalization $2,000,000, shares $1 par. A. J. Head, president; W. S. Goldsworthy, secretary. Lands, 14 claims, area 280 acres, in the Turkey Creek district of Yavapai county, Arizona, showing 12 veins, opened by 7 shafts, of 40′ to 60′ depth each, with a large open-cut and a 170′ tunnel on the Christmas Gift claim, showing a vein of 4′ to 6′ width, giving ores assaying 4% to 14% copper and $11 to $36 gold per ton.

CORONA COPPER MINING CO. WISCONSIN.

Office: 804 Winthrop Bldg., Boston, Mass. Property is the mine in Douglas county, Wisconsin, formerly held by the Chippewa Copper Mining Co., of which the present company is a reorganization.

CORONA GOLD & COPPER CO. NEW MEXICO.

Has claims near Santa Rita, Grant Co., N. M. Company reorganized, 1903, with O. H. Baum, president.

CORONADO GOLD & COPPER MINING CO. ARIZONA.

Office: care of Chas. P. Myers, president and general manager, Prescott, Ariz. Lands, 2,800 acres, including the Black Warrior group, in the Black Hills district of Yavapai county, Arizona. Company plans continuous development and is said to have considerable ore in sight.

CORONADO MINING CO. ARIZONA.

Office: 10 P. O. Square, Boston, Mass. Mine office: Metcalf, Graham Co., Ariz. Employs about 50 men. Wm. B. Thompson, president; J. W. Belches, vice-president; Wm. J. Palmer, secretary; J. W. Hazen, treasurer; Harry L. Westlake, general manager; T. H. Probert, engineer. Organized 1902, under laws of Maine, with capitalization $3,000,000, shares $10 par, with 200,000 shares unissued. Lands, 23 claims, area about 400 acres, in process of patenting. Ore is slightly auriferous and argentiferous chalcopyrite, developed by several shafts and tunnels. Property adjoins the Detroit and Arizona mines, and is supposed to carry the continuation of the famous Coronado vein. The Emerald claim shows a large ore body, giving average assays of about 9% copper. Mine is making regular ore shipments to the Shannon smelter and property is regarded as both promising and well managed. Plans said to be forming for consolidation of San Jose mines with the Coronado, early in 1904, under name of Standard Consolidated Copper Co.

NUEVA COMPANIA MINERA DE CORPUS CHRISTI. MEXICO.

Mine office: Matehuala, San Luis Potisi, Mex. W. B. A. Dingwall, president and manager. Ores carry silver, lead, gold and copper. Principal development is by an 1,800′ tunnel. Employs upwards of 100 men.

SOCIEDAD DE MINAS Y FUNDICION DE CORRALES. ARGENTINA.

Mine office: Chilecito, Rioja, Argentina. Has auriferous and argentiferous copper ores, with 12-ton smelter and gas power. Employs about 100 men.

JOSE FRANCISCO CORREA. CHILE.

Office and mine: San Fernando, Colchagua, Chile. Has steam power and a small smelter, employing about 100 men, securing a limited production of copper matte.

CORTLAND GOLD & SILVER MINING CO. **COLORADO.**

Mine office: Ohio, Gunnison Co., Colo. Victor Reno, superintendent. Ores carry gold, silver, lead, copper and zinc. Has gasoline power and employs about 15 men.

CORUNA COPPER CO., LTD. **SPAIN.**

Offices: Chiswell House, Finsbury Pavement, London, E. C., Eng. Mine office: Arca, Coruña, Spain. Sir W. H. D'Oyly, chairman; R. F. A. Malabar, secretary. Capital, nominal, £1,000,000; issued, £902,957. Lands, 2,740 acres, including the Santiago mines, bought for £900,000 in shares. Property was promoted by the notorious Ernest Terah Hooley. Ores occur in immense bodies, carrying about 2% copper, and are said to be refractory.

CORY BROS. MINING CO. **MONTANA.**

Office: Helena, Deer Lodge Co., Mont. Was prospecting a group of copper and gold claims on Beaver Creek, north of Helena, at last accounts.

COSTELLO COPPER CO. **ARIZONA.**

Office: care of Martin Costello, Tombstone, Cochise Co., Ariz. Organized August, 1903.

COTTONWOOD COPPER MINES. **NEVADA.**

Lands supposed to be located in vicinity of Azurite, Churchill Co., Nev.

COW CREEK COPPER MINING CO.

Address: care of Herman C. Ridder, Denver, Colo. Location of property, if any, not learned.

COXHEATH MINE. **NOVA SCOTIA.**

Owned by Cape Breton Copper Co., Ltd.

CRACKERJACK MINE. **ARIZONA.**

Mine office: Payson, Gila Co., Ariz. A. Lockwood, owner.

CREEDE COPPER MINING CO. **WYOMING.**

Supposed to have claims near Rawlins, Carbon Co., Wyo., but letter to that address returned unclaimed.

CRESCENT COPPER CO. **UTAH.**

Supposed to have copper claims near Park City, Summit Co., Utah.

CRESCENT COPPER CO. **WYOMING.**

Office and mine: Encampment, Carbon Co., Wyo. G. E. Heber, superintendent. Lands, about 100 acres, adjoining the Kurtz-Chatterton mine, 7 miles from Encampment. Has an 800′ tunnel. Idle at last accounts.

CRESCENT COPPER MINING CO. **ARIZONA.**

Office: care of Carl Clausen, president and general manager, Bisbee, Ariz. W. A. Eckerly, secretary; A. C. McDonald, superintendent. Organized 1903, under laws of Arizona, with capitalization $2,500,000, shares $2.50 par. Lands, 12 claims, in Tombstone Canyon, about 2 miles northwest of Bisbee, showing oxide and carbonate ores, with small quantities of chalcocite and iron ore, and quartz gangue, giving average assays of 19.1% copper and 41 oz. silver per ton, from a vein ranging 8′ to 30′ in width.

MINA EL CRESTON DE COBRE. **MEXICO.**

J. J. McCullom and J. L. Sheppard, owners. Said to show rich oxide and carbonate ores, and to be located in La Dura district of Sonora, Mex., but letter addressed to La Dura returned by postmaster with notation that no such property exists in that district.

CROESUS GOLD & COPPER MINING CO. **IDAHO.**

Office: Beatrice, Neb. Mine office: Hailey, Blaine Co., Idaho. W. G. Page, superintendent. Ores carry gold, silver and copper. Has steam power and a 10-stamp mill, employing about 20 men.

CROFTON SMELTER. **BRITISH COLUMBIA.**

Owned and operated by Northwest Smelting Co.

CRONA COPPER CO. **COLORADO.**

Office: Clay Centre, Kan. Mine office: Lyons, Boulder Co., Colo. Chas. A. Southwick, president; C. W. Strong, secretary and treasurer. Organized, 1901, under laws of New Mexico, with capitalization $1,000,000, shares $1 par. Lands, 14 claims, 2 miles from Lyons. Was doing developing work at last accounts.

CRONNEBANE MINES. **IRELAND.**

Sold to the Ovoca Copper Syndicate, Ltd.

CROWL CREEK COPPER MINING CO. **AUSTRALIA.**

Mine office: Shuttleton, Nymagee district, New South Wales, Australia. J. Booth, manager. Has steam power, concentrator and smelter with reverberatory furnaces. Employed about 100 men at last accounts. Mine is said to be developing very satisfactorily.

CROWN LYELL, LTD. **TASMANIA.**

Offices: 45, Renfield St., Glasgow, Scotland, and 70, Queen St., Melbourne, Australia. Mine office: Mount Lyell, Montague Co., Tasmania. Employs 12 men. Capital, nominal, £300,000; issued, £155,007. J. B. Sutherland, secretary; John Wedd, mine manager. Has steam power. Is prospecting by a 719′ tunnel.

CROWN POINT MINING CO. **WASHINGTON.**

Promoted by the Pioneer Investment & Trust Co., 709 Grant Bldg., Los Angeles, Cal. Said to have claims in Chelan county, Washington, carrying silver, copper and molybdenum.

COMPANIA DE LA CRUZ. **MEXICO.**

Mine office: La Cruz, Tamaulipas, Mexico. J. M. Gonzales, manager. Produces copper and lead ore upon a considerable scale, and employs about 200 men.

CRYSTAL MINING CO. **WASHINGTON.**

Office: 45 Jamison Blk., Spokane, Wash. Mine office: Bolster, Okanogan Co., Wash. John Gray, superintendent. Ores carry gold, silver, lead and copper. Has steam power and a small smelter.

CRYSTAL LAKE GOLD & COPPER MINING & SMELTING CO. **COLORADO.**

Office: 915 Barristers' Hall, Pemberton Sq., Boston, Mass. Philip G. Dawson, president; Kendric P. Crawford, treasurer and general manager;

A. D. Wise, secretary. Capitalization $1,500,000, shares $1 par. Has 10 claims, 4 on Hotchkiss Mountain, south of Lake City, Hinsdale county, Colorado, also other claims in vicinity, carrying ores of gold, silver, copper and lead.

CRYSTAL MOUNTAIN MINING & DRAINAGE CO. COLORADO.

Mine office: Crystal, Gunnison Co., Colo. Geo. W. Melton, superintendent. Ores carry copper, gold and silver. Mine opened by tunnel, and has steam power. Small force employed at last accounts.

CUBA MINING CO. UTAH.

Mine office: Bingham Canyon, Salt Lake Co., Utah. John Swanson, superintendent, at last accounts. Property has copper-gold ores, opened by tunnel. Has steam power, and was working a small force on development, at last accounts.

CUBAN EXPLORATION CO. CUBA.

Office: 11 Nassau St., New York. Mine office: El Caney, Santiago, Cuba. W. A. Dennis, vice-president and general manager. Is reopening old and developing new copper properties in the vicinity of Santiago de Cuba.

CUBAN MINING & DEVELOPMENT CO. CUBA.

Offices: Dashwood House, London, E. C., Eng. Mine office: Bahia Honda, Pinar del Rio, Cuba. J. J. Jonas, chairman; G. W. Hoghton, managing director in London; F. Kobly, managing director in Havana; Frederick J. Rich, mine manager; A. Mitchell, secretary. Registered 1902, to take over the business of the Cuban Exploration Syndicate, Ltd., with authorized capital of £250,000; issued, £150,007. Property shows considerable ore, largely in old workings. Lands, 2,766 acres, with 5 old shafts and rather extensive workings in bad condition. Present company has sunk 2 new shafts, and is developing in a conservative manner with a force of about 150 men.

CUBANA CONSOLIDATED COPPER CO. MEXICO.

Office: Lick House, San Francisco, Cal. Mine office: Arizpe, Sonora, Mex. Employs 20 men. Organized Jan. 6, 1903, under laws of Arizona, with capitalization $500,000, shares $1 par. Don Ray, president; A. H. Rose, vice-president; M. A. Nurse, secretary; Geo. H. McLean, superintendent. Lands, 244 pertenencias, area 602 acres, bought for $20,000, in the Arizpe district, showing 6 ore bodies with widths of 4′ to 20′, of which 3 are being developed, these carrying estimated average values of 12% copper, 10 oz. silver and $2 gold per ton, and being opened by 6 shafts, deepest 102′ and a number of tunnels, longest 250′ and 575′, with 1,415′ of underground openings. Uses horse power. Mine is about 40 miles from La Cananea, the nearest railroad point, which is connected with the mine by a good wagon-road. Sample carloads of ore smelted gave returns of 23% copper, with fair gold and silver values. Company plans the installation of a steam or gasoline hoisting and pumping plant. Property is one of considerable promise.

CUCHARAS MINING CO. MEXICO.

Mine office: Acaponeta, Tepic, Mexico. J. W. Winston, manager. Operates San Juan copper mine, opened by shaft and tunnel. Has steam and 40-ton smelter. Employs about 50 men.

MINAS LA CUEVA & PEDRO ESTABAN. **ME**

Mine office: Mazapil, Zacatecas, Mexico. Owned by estate of J. S rison. Manuel R. Orozco, manager. Produce copper as a by-p from silver-gold ores. Have steam power and 25-ton smelter. Employ 100 men.

LA CUIVRE GROUP. **BRITISH COLU**

Owned by E. A. Cleveland, Vancouver, B. C. Located on P Royal Island, Skeena River Division, Cassiar District, B. C. Develo limited to tunneling.

CULLIGAN MINE. **WISC**

A property in Douglas county, Wisconsin, which produced a littl grade ore (said to have come from a Michigan mine) in 1899.

CULLOWHEE COPPER CO. **NORTH CAR**

Office and mine: Cullowhee, Jackson Co., N. C. Capitalization, $1 D. D. Davis, president; R. E. Bowen, treasurer; Thos. A. Cox, se and superintendent. Has steam power and Sullivan air compressor.

CUMARAL MINES & DEVELOPMENT CO. **ARI**

Office: Oakland, Cal. Mine office: Old Glory, Pima Co., Ariz. Staples, superintendent. Has auriferous and argentiferous copper ore gasoline power and employs about 20 men.

CUPRITE COPPER CO. **ARI**

Mine office: Vail, Pima Co., Ariz. W. H. Lake, superintendent, accounts. Property supposed to be idle.

CUPRITE MINING CO. **WYO**

Mine office: Holmes, Albany Co., Wyo. Employs a small force.

CUSHING & WALKUP. **ME**

Mine office: Otaez, Durango, Mex. Emil Bruckhold, superinte Operate the Quien Sabe, Promontorio and other mines, employing 200 men. Development is by tunnels. Mines have steam power and smelter with a single matting furnace. El Cobre mine of this fir been sold to the Compania Minera de Cobre de Durango. Producti copper is small, as copper is used merely as a carrier in making an copper matte averaging 15% copper, 300 to 400 oz. silver and 12 o oz. gold per ton.

CYPRESS MINE. **ARI**

Mine office: Bigbug, Yavapai Co., Ariz. Owned by Joseph Mayer, Frank Thornton, superintendent. Claimed to have a good showing o per gold-silver ores. Said to be under bond to eastern capitalists.

DAIRA MINE. **J**

Mine office: Fujikoto-mura, Yamamoto-gori, Ugo, Japan. Mi opened, 1862, on numerous veins without fixed strike or dip, and freq crossing, in andesite country rock. Ores are galena, chalcopyrite, sph and iron pyrites. Product is chiefly silver and lead, with a trivial amo copper as a by-product.

DAKOTA CALUMET COMPANY. **SOUTH DAKOTA.**

Office: Lima, Ohio. Mine office: Sheridan, Pennington Co., S. D. Employs 31 men. Hon. Chas. Foster, president; Samuel A. Baker, vice-president; Wm. J. Booth, secretary; H. C. Ellison, treasurer; E. Z. Wallower, managing director; A. C. Overpeck, general superintendent; R. L. Knutson, consulting engineer. Organized 1902, under laws of South Dakota, with capitalization $3,000,000, shares $1 par. Ended 1903 without debts or liabilities and with sufficient cash on hand to complete the plant as planned. Lands, 19 patented claims, including the Lilian group, area 179 acres, also a 27-acre mill and smelter site, with total landed holdings of 319 acres, in the Black Hills district. Has shafts of 40′, 80′ and 100′ and a tunnel of 380′, giving total underground openings of 600′, on the strength of which a 150-ton smelter has been built. Has a 40-h. p. hoist, good for depth of 1,000′, a 10-drill Sullivan air compressor and 5-power drills. Buildings include a carpenter shop, smithy, laboratory and three dwellings. The smelter is a quarter of a mile from the mine and several hundred feet lower, of wood on stone foundations, connected with the mine by a Bleichert aerial tram. Smelter has a Colorado Iron Works 150-ton blast furnace with 120-h. p. steam plant and is planned to turn out pimple copper of 80% tenor. The Burlington railroad is within 4 miles of the works. Smelter was nearing completion at the end of 1903 and company plans to begin active production reasonably early in 1904.

The officers of this company are men of good standing, but repeated efforts to secure particulars regarding the nature and extent of the ore bodies have been met by repeated promises and evasions, the statement of the company furnished for this work answering no questions whatever regarding the size and character of the ore bodies.

DALANE SOELV-OG-KOBBERGRUBER. **NORWAY.**

Mine office: Brunkeberg Sogn, Norway. Is very irregularly worked, and is a small producer of silver and copper, when operated.

DALKEY MINE. **AUSTRALIA.**

Office: Port Adelaide, South Australia. J. Johnson, manager. Has steam power, and employed about 20 men at last accounts.

DALTON & LARK MINING & MILLING CO. **UTAH.**

Absorbed by Bingham Consolidated Mining & Smelting Co.

DALY COPPER MINING CO. **AUSTRALIA.**

Mine office: Leighs Creek, South Australia. F. Sutherland, manager. Has steam power, and employed about 20 men at last accounts.

DALY MINING CO. **MONTANA.**

Office: care of John D. Ryan, Butte, Mont. Mine office: Copperopolis, Meagher Co., Mont. Organized 1903, under laws of Arizona, with capitalization $1,000,000, to take over sundry mining properties of the Marcus Daly estate in Meagher, Silver Bow and Lewis & Clarke counties, Montana. Properties in Meagher county are the Copperopolis, Daly, North Pacific, Darling Fraction and others. The Copperopolis mines have 3 shafts, deepest 500′, with good surface equipment, and have been small producers of high-gra ore for many years, until recently. Idle at last accounts.

DALY JUDGE MINING CO. **UTA**

Office: Salt Lake City, Utah. Mine office: Park City, Summit C Utah. Organized 1901, under laws of Utah. Employs about 250 m John Daly, president; O. J. Salisbury, general manager; John McSorl superintendent. Lands, 715 acres, including the Anchor mine, with thr ore bodies, known as the South, Contact and North veins, the middle or Contact vein being the principal producer and showing a well defined and persistent outcrop, traced 3,000′. Property also included the Bonanza group, regarded as valuable but lacking development. Ore values are mainly in silver and lead, with a little copper as a by-product. The 6,000′ Anchor tunnel, for operating and drainage purposes, was completed in 1903. This is connected with the 1,200′ level of the 1,650′ three-compartment Anchor shaft, which has a powerful hoist operating double-deck cages. The mine was retimbered throughout, at heavy cost, in 1903. The Anchor workings show about 200,000 tons of ore blocked out for stoping. The mine has about 8 miles of underground openings, and makes 300 to 450 gallons of water per minute, this being sufficient for the use of the concentrator. There is also a lake, two miles from the mine, affording an alternative water supply.

The concentrator, completed in 1903, has a capacity of about 300 tons daily, and the management plans to increase the capacity to 400 tons. The Sherman slimes process in use proves highly efficient. Zinc middlings from the mill are sold to the Park City Magnetic Zinc Separation Co. Production is about 600 to 700 tons of crude ore daily, of which about 50% is concentrating ore, which is reduced six into one, giving a daily product of about 50 tons of concentrates having a net value of approximately $35 per ton.

The company has expended large sums on development and equipment. Operations for 1903 were decidedly disappointing to shareholders, owing to the retimbering of the mine and alterations at the mill, causing small production and heavy expenses, but the work performed was necessary and places the mine in a much better condition for future operations. The company is said to plan a $300,000 bond issue for further work of improvement. The property is unquestionably valuable, but is not out of the woods yet. However, the management is good, and should pull the mine through successfully.

DALY WEST MINING CO. **UTAH.**

Office: 161 Main St., Salt Lake City, Utah. Mine office: Park City, Summit Co., Utah. Employs 500 men. Organized Feb. 14, 1902, under laws of Colorado, with capitalization $3,600,000, shares $20 par. J. E. Bamberger, president and general manager; J. D. Wood, vice-president; J. Barnett, secretary; W. S. McCornick, treasurer; John A. Kirby, mine superintendent; F. W. Sherman, mill superintendent; Corporation Trust Co of New York, First National Bank of Boston and McCornick & Co., of Salt Lake City, registrars; McCornick & Co. of Salt Lake City, American Loan & Trust Co. of Boston and North American Trust Co. of New York, transfer agents. Lands, 50 patented claims, area 250 acres, in the Uintah district, showing extensive ore bodies carrying good values in silver, lead, copper and gold. In 1902 the ores averaged about 2% copper. Ore, as produced, is about equally divided between smelting and concentrating grades. The mine has three main veins, of 4′ to 6′ minimum and up to 40′ maximum width. Mine has an extreme depth of 1,550′, with about 10 miles of underground openings. Equipment includes all necessary shops, a bunk-house, dwellings, etc.

The concentrator was increased in capacity in 1903 to 225 tons daily, and in 1904 is to be increased to 300 tons daily capacity, in addition to which it is planned to handle about 250 tons of tailings daily. The mill is equipped with crushers, rolls, two 5′ Huntington mills, Wilfley tables, etc., and is to have an automatic ore-sorting belt. The practice of this concentrator under the management of Mr. Sherman is exceptionally advanced, and results secured on complex ores are not exceeded in any American reduction plant. The property netted profits of nearly $150,000 monthly in 1903, paying dividends of $1,278,000 in 1903, and to Jan. 1, 1904, has a dividend record of $3,591,000. Production for 1903 was 3,160,824 lbs. of refined copper, 34,742,791 lbs. of lead, 22,573,355 lbs. of zinc, 4,382,222 oz. of silver and 3,195 oz. of gold. The property is one of the best mines in Utah and is an exceptionally well handled and valuable mine.

DAMARALAND COPPER SYNDICATE, LTD. **GERMAN SOUTHWEST AFRICA.**

Offices: Salisbury House, London, E. C., Eng. Mine office: Windhoek, German Southwest Africa. Registered April 14, 1902. Capital, £10,000, shares £1 par, 4s. called. Sir F. Frankland, chairman; W. H. Willoughby, secretary; C. S. Herzig, manager. Is developing the Matchless mine.

DANES LEA MINING CO. **CALIFORNIA.**

Office: care of W. C. Harland, president, San Diego, Cal. Mine office: Encinitas, San Diego Co., Cal. W. H. McKinnon, manager. Lands, 20 claims, 8 miles east of Encinitas, with shafts of 100′ and 280′, also tunnel. Has a 3′ vein of medium-grade chalcopyrite, traversing porphyry. Has gasoline power. Erection of concentrator under consideration.

DARNELL MINING & MILLING CO. **WASHINGTON.**

Mine office: Kalama, Cowlitz Co., Wash. H. M. Stevens, superintendent. Ores carry gold, silver and copper. Has steam power, concentrator and 50-ton cyanide plant, employing about 40 men.

DAULTON COPPER CO. **CALIFORNIA.**

Supposed to have property near Daulton, Madera Co., Cal.

DAVENPORT MINE. **WASHINGTON.**

A prospect, near the head of Horseshoe Basin, Washington. A ton of ore shipped to smelter gave returns of $69, in lead, copper, silver and gold.

DAVID HARUM COPPER CO.

Office: 30 Broad St., New York. Location of property, if any, unknown.

DAVIS MINING & SMELTING CO. **CALIFORNIA.**

Office: care of Dr. J. Doan Carey, secretary, Los Angeles, Cal. Mine office: Oro Grande, San Bernardino Co., Cal. Lands, 3 copper claims and 9 gold claims. Had an 80-ton smelter with water-jacket blast furnace, clos down July, 1903, and supposed to have been sold to the Southweste Smelting Co.

DAWES RANGE COPPER & GOLD MINING CO. OF QUEENSLAND. (NO LIABILITY). **AUSTRALI**

Offices: 98, Queen St., Melbourne, Australia. Hon. Henry Forste J. P., chairman; John Brown, manager; Stobbs & Roscoe, 76, Bishopsgat St., London, E. C., England, British agents. Organized 1900, under laws of Victoria, with authorized capital £300,000; issued, £250,000. Lands, 240 acres, are in the Gladstone district of Queensland. Idle at last accounts.

DAY DREAM & BRETONARTE COPPER MINING CO. **AUSTRALIA.**

Mine office: Leighs Creek, South Australia. F. M. Montague, manager. Has steam power and is said to employ about 50 men.

DE LAMAR COPPER REFINING CO. **NEW JERSEY.**

Office and works: Carteret, Middlesex Co., N. J. Organized 1903, under laws of New Jersey, with capitalization $2,000,000. J. R. De La Mar, president; L. Vogelstein, vice-president; W. O. Fletcher, secretary and treasurer. Plant has a refinery with a monthly capacity of 3,500 tons of copper, supplies coming monthly from Utah, Montana, Arizona and California, with odd lots picked up from other producing fields. Copper is received in slabs or cakes and cast into anodes, which are then refined electrolytically, slimes being treated by a silver refinery having filter-presses and complete equipment for the refining and parting of gold and silver. In connection with the refinery is a sulphate plant, where bluestone is produced for the requirements of the refinery. There is also a blast-furnace where rich copper ore is occasionally smelted, this being suitable for smelting tests of sample ore shipments under the best metallurgical conditions. Works are located near Arthurs' Kill, which is the lighterage limit of New York harbor, and are served by two competing railroads. The plant is practically under the control of the prominent metal-brokerage firm of Aron Hirsch & Sohn, of Halberstadt, Germany.

DE LAMAR-WALL MINING & MILLING CO. **UTAH.**

Property is under control of the Utah Copper Co.

DECATUR COPPER MINING CO. **ARIZONA.**

Office: 503 North Main St., Decatur, Ill. Mine office: Jerome, Yavapai Co., Ariz. Organized 1897, under laws of Arizona, with capitalization $2,000,000, shares $1 par. W. J. Wayne, president; Geo. R. Bacon, secretary; W. S. Owens, superintendent. Lands, 10 claims, area 180 acres, also a 10-acre millsite, 10-acre smelter site and sundry other lands, in the Verde district, showing 10 fissure veins and lenses, of which 4 are being developed, these having an average width of 4′ and giving average assays of 5% to 8% copper, 20 oz. silver and $10 gold per ton. Has oxide and carbonate ores near surface with sulphides below 60′ depth, opened by 6 shafts, deepest, 280′, and tunnels of 70′ and 150′. Also has a free-milling gold vein in the Mineral Point district. Has gasoline power. Officers are men of good standing. Mine was closed down November, 1903, but is expected to resume work in 1904.

DEDHAM COPPER MINING CO. **WISCONSIN.**

Office: West Superior, Wis. Organized November, 1902, under laws of Wisconsin, with capitalization $1,300,000, shares $25 par; debentures, $150,000 authorized, at 6%. Abram B. Ross, president; Wm. C. Burke, secretary. Lands, 320 acres, also a 12-acre millsite, with waterfall of about 2,400 h. p. available. Has steam power and air compressor. Property was tested by 34 pits, showing 3 cupriferous amygdaloid beds, each averaging 90′ width with about one-third mineralized. Is developing by shaft. Officers are men of good standing and development is along business-like lines.

DEEP RIVER GOLD MINING CO. **NORTH CAROLINA.**

Mine office: High Point, Guilford Co., N. C. W. G. Gaither, manager. Was reopening an old gold and copper mine, at last accounts.

DEER CREEK DEVELOPMENT CO. **UTAH.**

Organized early in 1903, with capitalization $125,000, shares 25c. par. John Cleghorn, president; Henry Johnson, secretary. Land, 7 claims, in the Deer Creek field of the American Fork mining district, Utah, showing a 3′ to 6′ fissure vein in granite, ore therefrom giving assays of 22% copper and 7 oz. silver per ton.

DEER CREEK GOLD & COPPER MINING CO. **WASHINGTON.**

Mine office: Silverton, Snohomish Co., Wash. Said to have developed a considerable body of low-grade ore, by drifts from a tunnel.

SOCIEDAD MINERA DEFENSO y TODOS SANTOS. **CHILE.**

Mine office: Taltal, Antofagasta, Chile. Daniel Olivia, superintendent. Has auriferous copper ores and employs about 40 men.

DEL COBRE CONSOLIDATED CO. **ARIZONA.**

Mine office: Florence, Pinal Co., Ariz. Has a group of 15 claims, about 12 miles east of Florence.

DEL NORTE COPPER CO. **ARIZONA.**

Office: care of Ellery R. Bassett, New Bedford, Mass. Formerly had property near Kirkland, Yavapai Co., Ariz., but supposed to have lost its lands, rendering stock worthless.

DEL NORTE COPPER CO. **CALIFORNIA.**

Supposed to have claims near Smith River, California.

DELAWARE MINE. **MICHIGAN.**

An idle property in Keweenaw county, Michigan, on which sums aggregating about $3,300,000 have been sunk by successive managements. Very fully described in Vol. II.

DEMOCRATA MINING CO. **MEXICO.**

Mine office: La Cananea, Sonora, Mex. H. H. Hoffman, owner, 17 East Fourth St., Cincinnati, Ohio; J. Hook, superintendent, La Cananea. This is the oldest mine at La Cananea and is surrounded by the property of the Greene Consolidated. Has a 500′ tunnel, 450′ shaft, steam power and 125-ton smelter. Employs about 200 men. Ores are rich, and property is supposed to be highly profitable, especially since given benefit of railroad connection.

DENVER MINE. ARIZONA.

Mine office: Gilbert, Yavapai Co., Ariz. John Witherally, owner. Was developing a gold-copper ore body at last accounts.

DENVER COPPER MINING & LEASING CO. COLORADO.

Supposed to have claims in the Morrison district of Colorado.

DENVER GROUP GOLD & COPPER CO. ARIZONA.

Office: 319 Douglass Bldg., Los Angeles, Cal. Mine office: Wickenburg, Maricopa Co., Ariz. Capitalization $2,000,000, shares $1 par. Thos. S. Wadsworth, president. Lands, 10 patented claims, area 194 acres, 12 miles northeast of Wickenburg. Mineral formation traced 6,000′, with width 80′ to 300′ of vein matter, showing scattered parallel veins and stringers. Has tunnels of 225′ and 600′, also 5 prospecting shafts. Assays show 15% copper and $10 gold per ton. Ore is sulphide, carrying a little native copper.

DERBY SYNDICATE, LTD. AUSTRALIA.

In voluntary liquidation. J. McLaren, 66, Finsbury Pavement, London, E. C., Eng., liquidator.

DEROFFSKI MINE. SIBERIA.

A small producer, near Semipalatinsk, Siberia.

COMPANIA MINERA FUNDIDORA DESCUBRIDORA. MEXICO.

See Descubridora Mining & Smelting Co.

DESCUBRIDORA MINING & SMELTING CO. MEXICO.

Office: Scranton, Pa. Mine offices: Mapimi, Durango, Mexico, and Conejos, Sinaloa, Mexico. D. Gough, general manager. The Descubridora group has a 500′ main shaft, showing large quantities of basic silver-copper carbonate ore, for fluxing which silicious ores are bought in the market. Has complete steam and electric power equipment, with a 600-ton smelter built in 1902, employing about 1,000 men when in full operation. Smelter was closed down late in 1903, but extensive development is under way at the mines. At Conejos there are several mines and a 200-ton smelter, a 36-mile railroad having recently been built from Conejos to Pelayo. Property supposed to have been sold to the Guggenheim Exploration Co., late in 1903.

DETROIT COPPER MINING CO. OF ARIZONA. ARIZONA.

Office: 99 John St., New York. Mine office: Morenci, Graham Co., Ariz. Employs about 1,000 men. Organized under laws of Michigan, with capitalization $1,000,000, shares $25 par. James Douglas, president; Geo. Notman, secretary and treasurer; Chas. E. Mills, general superintendent; Dr. L. D. Ricketts, consulting engineer; H. H. McLean, mine superintendent; G. E. Hunt, mill superintendent; H. S. Van Gorder, superintendent supply and mercantile department; J. B. Fleming, mechanical engineer. Mine was opened about 1880 and has become a very large producer. Lands are extensive, including the Ryerson, Arizona Central, Copper Mountain, Yankee, and Montezuma mines, at and near Morenci, opened by 3 tunnels and 3 shafts, deepest workings being about 400′ below the surface. Mine was originally worked open-cast, as the ore bodies are of immense size, though low in grade, averaging 3% to 4% copper with only traces of gold and silver. Ores are chiefly sulphide and highly silicious, with gangue carrying up to 40% alumina, requiring very careful handling. The concentrating ore, much the larger part of the production, is about one-half oxides and carbonates and one-half sulphides.

Extensive use is made of gas for power. A Loomis generator with capacity for making gas to supply 1,000 h. p. from soft coal has given very satisfactory results, averaging 1-h. p. hour from 1.5 to 1.75 lbs. of coal, effecting a saving of about 30% in fuel costs, and the coal plant now in use will probably be displaced by gas, eventually.

The concentrator and smelter, at Morenci, near the mines, were rebuilt and enlarged in 1901-1902, and the capacity of the concentrator was increased in 1903 to 800 tons daily. The ore is concentrated about 7 into 1, only 400 gallons of water being used in concentrating one ton of ore. About 1,800 gallons of water are in contsant use, 125 gallons per minute of clear water being supplemented by clarified water from ingenious and highly effective settling ponds and clarifiers designed by Mr. Hunt. The supply of fresh water is pumped from wells on the San Francisco river. The smelter has four 54x144" blast furnaces and one mammoth new furnace 51x264" at the tuyeres. Blast is furnished by a 250-h. p. gas engine, a steam engine and an electric motor. About 75% of the ore is smelted as concentrates. Flue dust is briquetted for resmelting. The smelter has an electric light plant and is thoroughly modern in equipment.

A 36" gauge railway connects the mines and smelter with the Arizona & New Mexico railroad at Guthrie. This line has a maximum grade of 3.5% and has 4 complete loops within an air-line distance of one and one-half miles, near Morenci. The company operates a mammoth department store and excellent hotel, and also maintains a library, gymnasium and club-room for employes. Production of refined copper was 18,721,411 lbs. in 1902 and about 17,000,000 lbs. in 1903. The property is managed with great skill and is an exceptionally fine example of a successful low-grade mine.

DETROIT-PARRY SOUND MINING CO., LTD. ONTARIO.

Office: 311 Wetherbee Bldg., Detroit, Mich. Employs 5 men. W. A. Phillips, president; H. C. Morris, vice-president; E. A. Covell, secretary; D. M. Pickett, superintendent. Organized June 3, 1903, under laws of South Dakota, with capitalization $3,000,000, shares $1 par; unissued, $2,509,250. Property is in the Parry Sound district of Ontario, and management gives no details as to acreage, ores or development.

DEVON UNITED MINES SYNDICATE, LTD. ENGLAND.

Offices: 6, Pall Mall, London, S. W., Eng. E. B. Haynes, chairman; F. N. B. Hill, secretary. Capital, nominal, £3,000, to be increased to £6,000. Lands, 100 acres on the river Tavy, Devonshire, England, carrying tin, copper and arsenic ores. Is developing on a limited scale.

DEWEY MINE. COLORADO.

Capitalized at $400,000, shares $1 par. Located 15 miles southeast of Saratoga, Carbon Co., Wyo. Idle at last accounts.

DEWEY MINE **UTA**

Mine office: Ibapah, Tooele Co., Utah. Is a small producer of cup erous silver ores.

DEWEY CONSOLIDATED COPPER & GOLD MINING & MILLING CO. **IDA**

Had claims near Grangeville, Idaho Co., Idaho. Letter to former of in Salt Lake City returned unclaimed.

DEWEY MINING CO. **IDA**

Had claims near Bear, Washington Co., Idaho. Letter to that addr returned unclaimed.

DEWEY & OLYMPIA GROUP. **NEW MEXI**

Office and mine: care of U. E. McDaniel, owner and manager, Co Grant Co., N. M. Ores carry gold, silver, lead, copper and zinc. Has ste power and 25-ton concentrator, employing about 20 men.

DIAMOND JOE MINE. **ARKANS**

Office: care of Frank Pease, Silver City, Montgomery Co., Ark. C carry silver, lead and copper.

DICKERSON MINING CO. **MONTA**

Mine office: Basin, Jefferson Co., Mont. J. W. Dickerson, mana Has steam and water power and was driving a tunnel, at last accounts.

DILL GOLD & COPPER MINING CO. **WYOMI**

Office: Prescott, Ariz. Mine office: Rambler, Carbon Co., Wyo. E ploys 3 men. W. T. Dill, president; Geo. S. Hollister, vice-president, tre urer and general manager; Ed. H. Wallace, secretary; Soren J. Sorens superintendent. Organized July, 1903, under laws of Wyoming, with c italization $1,500,000, shares $1 par. Lands, 4 patented claims, area acres, lying immediately north of the Doane, in the Battle Lake distri opened by shafts of 42′ and 60′. Company purposes sinking to water le and crosscutting.

DINGO COPPER MINING CO. **AUSTRALI**

Mine office: Essington, Rockley district, N. S. W., Australia. Produc about 200 tons of high-grade hand-picked ore in 1901.

DIRIGO-LA SAL CO. **UTA**

D. H. McCann, general manager. Supposed to be a merger of the Inte national and Dirigo-La Sal companies. Was doing development work last accounts.

DIVIDEND MINING & SMELTING CO. **NEW MEXIC**

Mine office: Estey, Socorro Co., N. M. Organized September, 19 with capitalization $3,000,000. D. M. Estey, president; B. F. Coburn, vi president and secretary; F. B. Street, treasurer. Lands, about 2,000 ac opened by sundry prospecting shafts and tunnels showing a good body very rich sulphide ores carrying small gold and silver values and a little le Has a 100-ton concentrator and plans installing a 50-ton smelter.

DIXIE MINE. **UTA**

Owned by Utah & Eastern Copper Co.

DOANE MINE. **WYOMING.**

Owned by Battle Lake Tunnel Site Mining Co.

DOANE-RAMBLER MINE. **WYOMING.**

Owned by Battle Lake Tunnel Site Mining Co.

DOANE-VERDE MINING CO. **WYOMING.**

Office: 1301 Monadnock Bldg., Chicago, Ill. Mine office: Encampment, Carbon Co., Wyo. John T. Clarke, president; Frank G. Brown, assistant secretary; Robert H. Young, general manager. Organized June, 1902, under laws of Wyoming, with capitalization $1,500,000, shares $1 par. Lands, 7 claims, on which a small amount of development work is being done in the hope of striking an extension of the rich veins found in the Doane-Rambler.

DOGAMARU MINES. **JAPAN.**

Mine office: Ago-mura Ochi-gori, Iwami, Japan. B. Hori, owner; J. Stajaki, general manager. Were opened circa 1845, reopened 1873. Ore is chalcopyrite associated with argentiferous galena, sphalerite, and iron pyrites, with quartz gangue. Principal vein, of 10′ to 25′ width, traverses granite-porphyry, with frequent faults. Has steam and electric power and a small smelter, employing about 600 hands. Production in 1900 was 6,056 momme of silver and 551,164 lbs. of refined copper.

DOGSKIN MINE. **NEVADA.**

Mine office: Reno, Washoe Co., Nev. Wm. Webster, superintendent, at last accounts. Ores carry copper and gold.

DOLCOATH MINE, LTD. **ENGLAND.**

Offices: 21, Copthall Ave., London, E. C., Eng. Mine office: Camborne, Cornwall, Eng. F. Harvey, chairman; O. Wethered, vice-chairman; F. W. Thomas, secretary; R. A. Thomas, mine manager. Capital, nominal, £350,000. Is a large producer of tin and a small producer of copper, being the principal mine of Cornwall at present. Has a shaft nearly one-half mile deep.

DOLLY B. MINE. **COLORADO.**

Mine office: Leadville, Lake Co., Colo. P. K. Connelly, manager. Ores carry gold, silver, lead and copper. Has steam and electric power and employs a considerable force.

DOLLY HYDE MINE. **MARYLAND.**

Located in Frederick county, Maryland, and is the principal copper mine of the state, though never a large producer and now idle. Ores occur as malachite, bornite and chalcopyrite, in limestone country rock.

DOLLY VARDEN MINE. **COLORADO.**

Mine office: Sunset, Boulder Co., Colo. Garner & Ewing, owners. L. A. Ewing, manager. Ores carry gold and copper. Has steam power and employs about 10 men.

DOLORES COPPER MINING CO. **MEXICO.**

Mine office: Matehuala, San Luis Potosi, Mex. W. B. A. Dingwall, general manager: Luciano Mureno, superintendent. Opened by tunnels and equipped with steam power. Employs about 300 men.

DOMINGUEZ COPPER MINING CO. **COLORADO.**

Mine office: Delta, Delta Co., Colo. Has claims near Dominguez Cañon.

DOMINION COPPER CO., LTD. **BRITISH COLUMBIA.**

Office: Toronto, Ont. Mine office: Phoenix, B. C. W. R. Williams, manager. Lands include the Brooklyn, Stemwinder, Standard, Rawhide, Idaho and Montezuma claims, near Phoenix, showing a considerable body of low-grade auriferous copper sulphides. Has been idle for about two years, but was mortgaged for $100,000 late in 1903, presumably to pay off a floating debt of about $50,000, and provide working capital. Has expended about $200,000 on development. Property thought to be valuable if given adequate capital and a vigorous and economical management.

DON CARLOS & EUREKA CONSOLIDATED COPPER MINING CO. **MEXICO.**

Office: Detroit, Mich. Mine office: Nombre de Dios, Durango, Mex. Property includes Don Carlos y Anexa, Eureka and other mines, located about 65 miles southeast of Durango. Vein is about 150′ wide, and mixed, carrying small stringers and pockets of high-grade bornite, with gold and silver values, assaying 18% copper, 7 grams gold and 3 kilos silver per ton. Production, about 75 tons of ore in three years.

DON JUAN MINE. **OREGON.**

Mine office: Geiser, Ore. N. H. Thibault, owner; D. D. McLeod, superintendent. Ores carry gold and copper. Has steam power and 10-stamp mill, employing about 20 men.

DONA LOUISA COPPER & GOLD MINING CO. **MEXICO.**

Office: 69 Wall St., New York. Mexican general office: 1A, San Francisco 7, Mexico, D. F. Mine office: Acuitzio, Michoacan, Mex. Organized 1902, under laws of Delaware, with capitalization $1,500,000, shares $5 par, $2 paid in. Chas. M. Heath, president; Wm. A. Buckman, vice-president; Manuel L. Ward, secretary; David Buchanan, treasurer; A. J. Peyton, general manager; Joseph G. Collinson, superintendent; T. Richmond Crum, engineer; Miguel Gojon, superintendent. Lands, 45 pertenencias, area 111 acres, about one mile from the Santa Emilia, in the Morella district of Michoacan, showing 4 fissure veins, of which two are being developed, these having 3′ average width and giving assays of 9% to 63% copper and up to 120 oz. silver and $32 gold per ton, from oxidized ores slightly developed by shafts and tunnels. Is 24 miles from Coapa, on the Mexican National Line, the nearest railroad station. Management is apparently honorable, and veins, while narrow, are rich, but the company is following the fatal policy of paying 10% dividends while still selling stock, which naturally hurts its standing in the eyes of all conservative investors.

DOROTHY MINE. **VIRGINIA.**

Mine office: Virgilina, Halifax Co., Va. Shipped a small quantity of sulphide ores in 1900. Presumably idle.

DOS CABEZOS CONSOLIDATED MINES CO. **ARIZONA.**

Mine office: Dos Cabezos, Cochise Co., Ariz. Oscar W. Roberts, superintendent. Has auriferous and argentiferous copper ores, with steam power and a small smelter.

DOUBLE STANDARD GROUP. **ARIZONA.**

Office and mines: Lochiel, Santa Cruz Co., Ariz. Frank Olsen, owner and manager. Ores carry copper, silver and lead.

DOUGLAS MINING & MILLING CO. **WYOMING.**

Mine office: Rambler, Carbon Co., Wyo. O. G. Blaisdell, superintendent. Property adjoins the Rambler, in the Douglas Creek district. Has shown cuprite carrying good assay values in gold.

DOUGLAS MINING & SMELTING CO. **NEVADA.**

Office: 220 Sansome St., San Francisco, Cal. Mine office: Yerington, Lyon Co., Nev. A. B. W. Hodges, general manager. Property is the Douglas group, in the Pioche district, carrying auriferous and argentiferous copper ores. Has bought the old Bluestone smelter and plans to begin actual production early in 1904. Property is said to have a considerable amount of ore blocked out for stoping.

DOUGLAS REDUCTION WORKS. **ARIZONA.**

Office: 99 John St., New York. Works office: Douglas, Cochise Co., Ariz. A Phelps Dodge & Co. enterprise, designed to eventually handle ores from the firm's mines in Cochise, Graham and Gila counties, Arizona, and the Moctezuma and Cananea districts of Sonora, Mexico. Plant, which is nearing completion, is described in the article on Copper Queen Consolidated.

DOVER MINING CO. **COLORADO.**

Mine office: Idaho Springs, Clear Creek Co., Colo. David Ellis, superintendent. Ores carry gold, silver and copper. Has steam power.

DRAGOON COPPER CO.

Office: 924 Columbus Ave., Boston, Mass Location of property, if any, not learned.

DRAGOON COPPER MINING & SMELTING CO. **ARIZONA.**

Office: 310 Frost Bldg., Los Angeles, Cal. Mine office: Tombstone, Cochise Co., Ariz. Organized May, 1902, under laws of Arizona, with capitalization $2,000,000, shares $1 par. C. M. Renaud, president; W. Arthur Phipps, vice-president; G. H. Mosher, secretary and treasurer; Geo. M. Henry, general manager. Lands, 20 claims, area 400 acres, near the Middlemarch and opposite the Black Diamond, showing 3 contact veins between limestone and porphyry, giving assays of 16% copper, 11% lead and 14 oz. silver per ton, from azurite, malachite, bornite and chalcopyrite. Has 4 short tunnels and a 465′ shaft showing high-grade ore at bottom. Has steam power and a 34-h. p. hoist, good for depth of 1,000′. Company plans sinking shaft to depth of 800′ and driving an 1,800′ tunnel to develop ore at depth of about 800′, and also plans installing an air compressor.

DRAGOON MINING CO. **ARIZONA.**

Office: 261 Broadway, New York. Mine office: Johnson, Cochise Co., Ariz. Idle. Geo. M. Jacocks, president; L. M. Clifford, general manager.

DROGSET KOBBERVAERK. **NORWAY.**

Mine office: Meldalen, Norway. Produced 2,718 tons of cupriferous pyrites in 1900.

DRUMMERS DEVELOPMENT CO. **WASHINGTON.**

Office: 15 Jamison Bldg., Spokane, Wash. Mine office: Chelan, Okanogan Co., Wash. R. D. Johnson, president; Thomas Maloney, secretary. Capitalization $100,000, shares 10c. par. Said to have done a limited amount of development work giving a fair showing of ore.

DUCHESS MINING, MILLING & SMELTING CO. WYOMING.

Mine office: Holmes, Albany Co., Wyo. LeRoy Grant, general manager. Was developing, on a small scale, during 1903.

DUCKTOWN COPPER MINES. GEORGIA.

Mine office: Pierceville, Fannin Co., Ga. Mine opened by shafts and has steam power. Supposed to be idle.

DUCKTOWN SULPHUR, COPPER & IRON CO., LTD. TENNESSEE.

Offices: 1, Gresham House, Old Broad St., London, E. C., Eng. Mine office: Isabella, Polk Co., Tenn. Col. Jas. LeGeyt Daniell, chairman; C. J. Browning, secretary; Joseph Gordon Gordon, managing director. Capital, nominal, £75,000; issued, £66,200, in 74,800 ordinary shares and 200 founders' shares of £1 each, profits being divisible on a basis of 7% plus one-half of net remaining profits to the ordinary shares, balance of profits going to the founders' shares. Debentures: £41,800 first mortgage 5%; £7,735 second mortgage 7%. Has paid dividends of 7½% to 17% annually, since 1897. Net profits in 1901 were £14,761 and net loss in 1902 was £1,218, but operations for 1903 gave a profit. Lands include the Mary, Callowell and other mines, acquired at a cost of £68,057. Ores are exclusively sulphide, averaging under 3% copper, and are without either gold or silver values. Has steam and electirc power. Smelter has a Herreshoff furnace with daily capacity of 60 tons of crude ore, or about 120 tons of roasted ore, with a No. 6 Connersville blower driven by a direct-connected engine. An important change in the smelting process was made in 1903, and instead of heap-roasting the ores as formerly, the pyritic system is employed, this making a 20% matte in the first fusion and a 50% matte in the second fusion, the change in smelting methods cutting down the capacity of the furnace, but effecting a considerable economy in fuel charges. Property also has an acid plant. The mines were opened previous to the American Civil War and their annual production is probably about 1,000,000 lbs. of refined copper.

DUGWAY COPPER MINING CO. UTAH.

O. F. Peterson, general manager. Lands are in the Deep Creek district of Utah. Has a 100' shaft on a 15' contact vein between limestone and porphyry. Ores assay 1% to 36% copper, and up to 45% lead, 17 oz. silver and $1.60 gold per ton.

DUKE GROUP. NORTH CAROLINA.

Mine office: Roxboro, Person Co., N. C. B. L. Duke, owner; Thos. Martin, superintendent. Lands, 470 acres. Property has 4 shafts, deepest 170'. Veins are fissures, ore having gangue of quartz, epidote and calcite. Has good steam power equipment.

LA DULCINEA MINE. CHILE.

Mine office: Copiapo, Atacama, Chile. Deepest shaft, 2,500'. Ores are oxides and carbonates to depth of 600', sulphides below. Vein is 25' wide in places. Ore runs 5% to 25% copper.

DULUTH COPPER CO. **SOUTH DAKOTA & ONTARIO.**

Not found by postal authorities at Duluth, Minn. Has copper claims in Trill Twp., Algoma, Ont., also near Custer City, Custer Co., S. D. Was prospecting South Dakota lands with diamond drill, late in 1902.

DULUTH & ARIZONA COPPER MINING CO. **ARIZONA.**

Office: 219 West Superior St., Duluth, Minn. Capitalization $1,000,000, shares $1 par. Chas. W. Ericson, president; Gideon Schelin, secretary. Lands, 4 claims, south of Prescott, Yavapai county, Arizona, showing ores giving average assay values of 11% copper and $6 gold per ton.

DUMP MINE. **COLORADO.**

Mine office: Black Hawk, Gilpin Co., Colo. Walter Lampshire, superintendent. Ores carry gold, silver and copper. Has steam power.

DUNCAN GROUP. **CALIFORNIA.**

Address: care of W. C. Duncan, owner, Oroville, Cal. Property is at Flournoys, Plumas Co., Cal. Reported values in Copper King shaft are 9% copper and $6 gold per ton. Development work is in progress.

DUNCAN MINING & DEVELOPMENT CO., LTD. **BRITISH COLUMBIA.**

Has 4 claims in Cowhican Lake district, Victoria, B. C., which have given assays of 4% copper and 50% lead, with gold and silver values.

DUNKIRK GOLD & SILVER MINING CO. **ARIZONA.**

Office: Prescott, Ariz. Mine office: Maxton, Ariz. Edw. Kinzle, superintendent. Ores carry gold, silver, copper and lead. Has gasoline power and employs about 10 men.

DUQUESNE MINING & REDUCTION CO. **ARIZONA.**

Mine office: Washington, Santa Cruz Co., Ariz. J. F. Tener, agent. Has a 635′ shaft. Ore is chalcopyrite, associated with sphalerite, galena and iron pyrites, in a fissure vein between granite-porphyry and limestone. Has steam power and air compressor. Idle.

LA DURA MINING CO. **MEXICO.**

Mine office: Torres, Sonora, Mex. Property is in charge of Hartmann & Groff. Ores carry gold, silver, copper and lead. Has steam power and employs a considerable force, shipping silver-lead-copper concentrates to smelters.

DURANGO COPPER SYNDICATE, LTD.

Lands sold, 1900, to Avino Mines of Mexico.

COMPANIA MINERA DE COBRE DE DURANGO. **MEXICO.**

Mine office: La Trinidad, Otaez, Durango, Mex. Wm. Dwinert, president. Operates copper property formerly owned by Cushing & Walkup.

DURANGO MINING CO. **MEXICO.**

Mine office: Yerba Buena, Durango, Mex. Capitalization $1,000,000. Lands, 5 claims.

DURGEE MINE. **VIRGINIA.**

In the Virgilina district of Virginia. Area, 1,500 acres. Has three shafts, deepest 175′. Vein averages 7′ wide, and assays 4% to 20% copper.

DUTCH MILLER MINING & SMELTING CO. **WASHINGTON.**

Office: 202 Denny Way, Seattle, Wash. Mine office: Skykomish, Snohomish Co., Wash. H. P. Fogh, general manager. Lands show vein with maximum width of 18′, carrying auriferous chalcopyrite, several small smelter shipments averaging $37.65 per ton, net. Has shaft, tunnel and open-cut, giving a fair showing of ore.

DUTTON MINE. **MONTANA.**

Mine office: Butte, Silver Bow Co., Mont. Patrick Wall, superintendent.

DZANSULSKI WORKS. **RUSSIA.**

Mine office: Tiflis, Kutais, Russia. T. L. Lazarev, owner. Production, 505,568 pounds fine copper in 1899. Supposed to have passed into hands of Caucasus Copper Co., Ltd.

EAGLE COPPER CO. **WYOMING.**

Office: 1608 Wazee St., Denver, Colo. Letters returned unclaimed from Battle and Encampment, Carbon Co., Wyo. Property is the Gertrude mine, carrying auriferous copper ores and equipped with steam power.

EAGLE COPPER & GOLD MINING CO. **IDAHO.**

Office: Wallace, Idaho. Organized 1902, under laws of Idaho, by J. H. Nordquist, et al. with capitalization $1,000,000, shares $1 par. Property, short distance southeast of Mullan, Idaho, has been undergoing development for several years.

EAGLE COPPER-GOLD MINING CO., OF ARIZONA. **ARIZONA.**

Office: 1027 Garfield Bldg., Cleveland, Ohio. Mine office: Wickenburg, Maricopa Co., Ariz. Alex. M. Fulford, president; Benj. J. Perry, vice-president and general manager; Herbert E. Hudson, secretary and treasurer; Oscar Jennings, superintendent. Idle. Organized August, 1902, under laws of South Dakota, with capitalization $1,000,000, shares $1 par. Lands, 5 claims, area 95 acres, in the Blue Tank district, showing 8 ore bodies, of which the principal one has a width of 12′ to 20′ and gives assays of 10% copper, 10 oz. to 35 oz. silver and $6 to $18 gold per ton, from oxide, carbonate and sulphide ores, developed by shafts of 50′ and 100′. Company plans installing a gasoline hoist and continuing development in 1904.

EAGLE COPPER MINING CO. **WASHINGTON.**

Mine office: Chewelah, Stevens Co., Wash. M. Mitchell, superintendent. Lands, 3 claims, south of the Wonderful group, on Stevens Peak. Assays show gold, silver, lead and copper. Developing by shaft and tunnel, at last accounts.

EAGLE METALLIC COPPER CO.

Organized March, 1903, under laws of New Jersey, with capitalization $500,000, by Henry D. Deshler, et al. Letter returned unclaimed from registered office, Belvidere, N. J.

EAGLE MINING CO. **CALIFORNIA.**

Mine office: Needles, San Bernardino Co., Cal. H. Ahrens, superintendent, at last accounts.

EAGLE & BLUE BELL MINING CO. **UTAH.**

Controlling stock interest was bought in 1903 by the Bingham Consolidated Mining & Smelting Co. Duncan McVichie, president and general manager. Lands lie between the Centennial-Eureka and Grand Central mines, two of the best properties in the Tintic district. Mine shows large bodies of auriferous copper ores on the 700′ and 750′ levels, and is sinking a blind shaft from end of the main tunnel.

EAST PACIFIC MINE. **MONTANA.**

Mine office: Windsor, Broadwater Co., Mont. Robt. A. Bell, owner; F. A. Taylor, superintendent. Ores carry gold, silver and copper. Has steam power and 25-ton smelter, employing about 50 men.

EAST-SIDE GOLD MINING CO. **ARIZONA.**

Letter returned unclaimed from advertised office, Lambertville, N. J. Mine office: Bisbee, Cochise Co., Ariz. Organized under laws of South Dakota, with capitalization $1,000,000, shares $1 par. Chas. C. McCoy, president and general manager; E. C. Gallagher, secretary; W. A. Eckerly, assistant secretary and treasurer. Lands, 9 claims, area 168 acres, about 6 miles east of Bisbee, showing veins opened by shafts of 60′ and 80′, giving assays of $8 to $265 gold per ton, with small copper values.

EASTERN NATIONAL COPPER CO., LTD. **NOVA SCOTIA.**

Office: 16 Prince St., Halifax, N. S. Mine office: Eastern Harbor, Cheticamp, Inverness Co., N. S. Idle, pending installation of power plant, but employed 80 men during the greater part of 1903. Jas. Reeves, president; Robt. J. Leslie, vice-president; John W. Regan, secretary and treasurer; M. V. Grandin, mining engineer. Organized September, 1902, under laws of Nova Scotia, with capitalization $5,000,000, shares $10 par; 30,000 shares unissued. Annual meeting, third Wednesday in January. Lands, 149 acres, held under 77-year crown lease, with mill and smelter sites and miscellaneous lands of 200 acres. Country rock is chlorite, serecite and hydromica schists, showing lenticular ore bodies with chalcopyrite finely disseminated throughout the gangue, with carbonate and oxide ores shown sparingly near the surface. Ore-bearing zone is about 270′ wide, 7,500, long and proven to depth of 85′. Average assays give 5% copper, 5 oz. silver and $3 to $5 gold per ton. Development is by 8 slope shafts, deepest 150′, and one short tunnel. Company estimates 185,000 tons of ore to be blocked out for stoping, and purposes developing 1,700 horse power from an available head of 565′, one mile from the mine, transforming and transmitting this power by electricity. Transportation is by water, nearest harbor being 7 miles from mine. Will soon have a railroad within 8 miles. Management will make exhaustive tests of ore preparatory to erection of permanent mining, concentrating and smelting plant. Property is regarded as one of most promising in eastern Canada.

EASTERN STAR MINE. **ARIZONA.**

Letter returned unclaimed from Williams, Coconino Co., Ariz.

***J. M.* ECCHEVARRIA.** **CHILE.**

Operates the Quilomenco mine, opened 1892, in the department of Illapel, Chile. Production, about 100 tons refined copper yearly.

ECHO MINING & MILLING CO. **WYOMING.**

Mine office: Rudefeha, Carbon Co., Wyo. Lands, 4 claims, lying north of and near the Ferris-Haggarty mine of the North American Copper Co.

ECLIPSE-ARGO MINE. MONTANA.

Office: care of Canol & Martin, Helena, Mont. Has steam power and concentrator, shipping concentrated ores averaging 20% copper.

ECTON MINE. ENGLAND.

An old property in Staffordshire, England, owned by the Duke of Devonshire. Was opened in Roman times and operated as recently as 1840. Depth is about 1,500′. Was the first English mine to use gunpowder for blasting, in 1677, and the first wire rope used for hoisting was employed there.

EDDY GOLD, SILVER & COPPER MINING CO. ARIZONA.

Office: Phoenix, Arizona. Organized August, 1903, with capitalization $1,000,000. H. P. DeMund, president; Neri Osborn, secretary; John Osborn, general manager. Lands, 11 claims, in Maricopa county, Arizona, about 40 miles northwest of Phoenix. Development is by open-cut and tunnels. Property considered promising.

EDISON MINING CO. BRITISH COLUMBIA.

Mine office: Yreka, Vancouver Island, B. C. Lands adjoin the Yreka Copper Co., Ltd. Development work gives a promising ore showing.

EDMUNDIAN (MANICALAND) COPPER CO., LTD. MOZAMBIQUE.

In voluntary liquidation. C. A. Dodds, Swan House, Great Swan Alley, London, E. C., England, liquidator.

EDNA MAY MINING CO. COLORADO.

Had claims in vicinity of Winfield, Chaffee Co., Colo. Letter returned unclaimed.

EINASLEIGH EXPLORATION SYNDICATE, LTD. AUSTRALIA.

Offices: 149, Bishopsgate St. Without, London, E. C., Eng. W. H. Woodhead, managing director; Thos. Mullett, secretary. Lands, mineral lease No. 1,197, area 40 acres, on the Einasleigh river, Gilbert county, Queensland, Australia.

EINASLEIGH FREEHOLD COPPER MINES, LTD. AUSTRALIA.

Offices: 149, Bishopsgate St. Without, London, E. C., England, and A. M. P. Chambers, Edwards St., Brisbane, Queensland, Australia. Mine office: Einasleigh, Gilbert Co., Queensland, Australia. J. S. Smith, chairman; Jos. Henry Smith, managing director; Thos. Mullett, secretary; F. Hambridge, secretary in Brisbane; J. Adler, superintendent. Capital, nominal, £200,000; issued, £180,000. Lands, 120 acres, freehold, at junction of Einasleigh and Copperfield rivers, also 20 acres adjacent carrying iron ore for fluxing. Main shaft, 190′. Mine has recently been given railroad connections, lack of which hampered developments previously. Underground work has shown a promising ore body. Has a 32x75″ water-jacket blast furnace, and employs about 100 men. Production in 1901 was 104 long tons copper and 1,330 oz. silver, from 1,009 tons of ore smelted.

EINASLEIGH SOUTH BLOCKS. AUSTRALIA.

Mine office: Einasleigh, Gilbert Co., Queensland, Australia. Owns mineral lands south of Einasleigh Freehold, and was sinking shaft, at last accounts.

EISENMANN Y CARDENAS. MEXICO.

Supposed to be operating in the neighborhood of Huacana, Ario district, Michoacan, Mexico.

EL CAPITAN COPPER CO. ARIZONA.

Office: 66 Broadway, New York. Organized 1901, under laws of Arizona, with capitalization $1,000,000. Jas. D. Taitt, president; Jas. H. Plummer, vice-president; Chas. H. Landers, secretary. Property is supposed to be somewhere in Yavapai county, Arizona. This is a Douglas-Lacey promotion, and repeated efforts to secure any information regarding the property, developments, and prospects have been unsuccessful. Apparently the property is of little importance, as reference to it is rarely or never made in the local newspapers. For an opinion on the business methods of Douglass, Lacey & Co., the reader is referred to the description of the Amalgamated Gold & Copper Co.

EL CARMEN COPPER CO. MEXICO.

Office: care of J. W. Wilson & Co., 52 Front St., New York. Mine office: El Carmen, San Juan de Heredia, Durango, Mex. Capitalization, $750,000. Development has shown a considerable body of auriferous and argentiferous concentrating ore. A 30-ton stamp-mill and concentrator have been ordered of the Colorado Iron Works Co.

EL COBRE MINES. CUBA.

Office: 71 Broadway, New York. Mine office: El Cobre, Santiago de Cuba. Employs 250 men. Organized 1902, under laws of West Virginia, with capitalization $5,000,000, shares $100 par, divided into $1,500,000 preferred and $3,500,000 common stock. Chas. F. Rand, president and treasurer; Wm. Astor Chanler, vice-president; Wm. C. Tegethoff, secretary; Chas. F. Rand, Wm. Astor Chanler, L. H. Severance, Colgate Hoyt, James C. Colgate, E. J. Barney, E. C. Felton, Wm. Henry Yale, E. W. Oglebay and Claudio G. Mendoza, directors; Pedro Aguilera, manager; Jennings S. Cox, Jr., consulting engineer; Morrison B. Yung, engineer. Holdings of this company include the properties owned formerly by the Royal Consolidated Mines of El Cobre, Ltd., San Jose Mining Co., Santiago Copper Mining Co. and El Cobre Railroad Co. Annual meeting, first Tuesday in March.

These mines were opened by the Spanish, in 1532, and probably produced the first copper made in America, excepting the native copper taken from the Lake Superior mines by prehistoric workmen. The first product of El Cobre mines was used for casting Spanish cannon. The properties were taken over, circa 1832, by a Hispano-English company, and ore produced was shipped to Swansea for reduction. The custom-house records of Santiago are said to show exports of 610,210 tons of ore, valued at $50,186,225 (probably in depreciated Spanish currency) from 1851 to 1869 inclusive, ores as shipped assaying from 12.69% upwards, and probably averaging about 16% in tenor. During the revolution of 1868 the big Cornish pump was burned and the mine flooded, remaining idle until bought by the present company in 1902. Property is 8 miles west of Santiago bay, on which the company has wharves, and El Cobre railway, owned by this corporation, connects the mines with the harbor and the city of Santiago. The property shows 3 wide veins, with strong outcroppings for a distance of some 6,500′. The old workings were extensive, including some 40 shafts, of which the four deepest were about 1,200′ each, with 17 miles of underground openings, the mine being timbered mainly with mahogany. The mine makes 500 to 1,200 gallons of water per minute in the rainy season, this being strongly acid and requiring pumps of composition metal with lead or wood-lined pipes. The new pumps at the property have a combined capacity of 5,000 gallons per minute, and the water, as forked from the mine, is leached over scrap-iron, producing cement copper to the value of about $5,000 monthly while unwatering the mine. The old waste-dumps contain about 250,000 tons of rejected material averaging about 2% copper. Considerable ore has been blocked out in open cuts for stoping, this averaging about 4% copper, and the tenor can be much improved by hand-sorting.

A 200-ton smelter is being built at Punta Sal, on Santiago harbor, 9 miles from the mine and connected therewith by El Cobre railroad, 9 miles in length, with termini at Punta Sal and the mine. This railroad, owned by the company, has 2 locomotives and 40 cars. Fuel used at the mine is bituminous coal costing $4.35 per ton, and the smelter will use coke costing $6.50 per ton.

El Cobre mines are of undoubted value. The present owners are financially strong, and are conservative in their operations, which are along legitimate lines. Upwards of $500,000 in cash has been expended in reopening and equipping the property, which will doubtless return good profits in time. The property is now producing about $50,000 worth of ore monthly, but no attempt is being made to secure a large output prior to the completion of the smelter.

EL DIAZ GOLD & COPPER CO. MEXICO.

Office: 332 Drexel Bldg., Philadelphia, Pa. Mine office: San Martin Hidalgo, Jalisco, Mex. Organized 1901, under New Jersey laws with capitalization $1,600,000, shares $1 par. Daniel Lamont, Jr., president and trustee; Aubrey F. Lee, secretary; J. R. Williams, manager. Lands, 60 pertenencias, about 410 acres, including 12 old workings, in the Rancho de Papinto district of Jalisco. Mine is opened by tunnels and shafts. Equipment includes 10-stamp mill, 25-ton chlorination plant and 80-ton smelter. Employs about 125 men.

EL DORADO COPPER MINING CO. CALIFORNIA.

Office: 517 Parrott Bldg., San Francisco, Cal. Mine office: Georgetown, El Dorado Co., Cal. Company claims to have 17 claims, carrying gold, copper and asbestos, and puts out an advertisement filled with misinformation regarding the profits of copper mining. Organized 1902, under laws of of Colorado, with capitalization $2,000,000. A. K. Green, president; W. E. Verson, superintendent. Lands, sundry gold and copper quartz claims, and 4 placer claims, including the Ford and Darling mines opened by 3 shafts, deepest 100′ and a 175′ tunnel. Management plans sinking a 3-compartment shaft.

EL REY GOLD & COPPER MINING CO. **WYOMING.**

Office and mine: Encampment, Carbon Co., Wyo. W. C. Henry, general manager.

EL TRIUMFO CONSOLIDATED MINING CO. **MEXICO.**

Mine office: Bacoachi, Sonora, Mex. B. Granville, managing director; A. C. Charlot, general manager. Lands, 165 acres, on which development has shown promising ore bodies of various sizes.

EL VERDE GRANDE COPPER CO. **MEXICO.**

Office: care of Percy Sharpe, Nogales, Ariz. Mine office: Imuris, Magdalena, Sonora, Mex. Capitalization $2,000,000, shares $1 par. Lands are in the foothills of the Sierra Azul, 14 miles from Imuris, which is on the Sonora railroad.

ELDORA ENTERPRISE GOLD MINING CO. **COLORADO.**

Mine office: Eldora, Gilpin Co., Colo. Chas. W. Sheehan, superintendent. Ores carry gold, silver and copper. Has steam power and a 10-ton smelter.

ELDORADO GOLD MINING & MILLING CO. **UTAH.**

Office: 549 Twenty-fifth St., Ogden, Utah. Don Maguire, general manager. Ores carry silver, lead, gold and copper.

ELECTRIC IRON & STEEL CO. **CALIFORNIA.**

Promoted by W. C. Brunson and J. W. Turner, who claim to own 7,000 acres of mineral land in the copper belt of Shasta county, California. Apparently an outrageous fraud, as no trace of the company can be obtained in Shasta county.

ELECTROLYTIC COPPER MINING & SMELTING CO. **OREGON.**

Letter returned uncalled from Imnaha, Wallowa Co., Ore.

ELIDORO VALENCIA. **PERU.**

Mine office: Quichin, Camaña, Peru.

ELITE GOLD & COPPER MINING CO. **WASHINGTON.**

Office: care of C. K. Humphries, Globe Bldg., Seattle, Wash. Mine office: Index, Snohomish Co., Wash. Capitalization, $1,000,000. F. R. Thompson, president; J. F. Douglas, secretary. Said to have a 9′ ore body giving assays of 20% copper and $133 gold, per ton.

ELIZABETH MINING CO. **VERMONT.**

Office: 301 North Charles St., Baltimore, Md. Mine office: South Strafford, Orange Co., Vt. Wm. Glenn, president; Jas. W. Tyson, Jr., secretary and superintendent. Has a considerable ore body giving assays of 3% to 6% copper. Has steam power and a small smelter.

ELK MOUNTAIN MINING & MILLING CO. **WYOMING.**

Office and mine: Encampment, Carbon Co., Wyo. Employed 5 men during the working season of 1903; idle for winter. T. R. Smith, president; S. E. Phelps, secretary and treasurer; B. A. Kaylor, superintendent. Organized 1900, under laws of Wyoming, with capitalization $1,000,000, shares $1 par. Lands, 660 acres, patented, in the Upper Platte district, showing three 5′ ore bodies in limestone, giving assays of 15% copper and $3 gold per ton, from chalcocite, bornite and chalcopyrite. Has 3 shafts, deepest 183′ and an 85′ tunnel, with steam and electric power. Will resume sinking in the spring of 1904.

ELLA COPPER MINING & DEVELOPMENT CO. CALIFORNIA.

Office: San Jose, Cal. Property, near the New Almaden cinnabar mine, is claimed to show a 40′ vein of 10% copper ore.

ELM RIVER COPPER CO. MICHIGAN.

Office: 60 State St., Boston, Mass. Mine office: Winona, Houghton Co., Mich. Organized April 20, 1899, under laws of New Jersey, with capitalization $2,500,000, shares $25 par; $12 paid in. Annual meeting, third Wednesday in April, at Jersey City, N. J. On Jan. 1, 1903, had a balance of assets $282,653.81. H. F. Fay, president; Geo. G. Endicott, secretary and treasurer; Jas. Chynoweth, superintendent; H. F. Fay, John C. Watson, Stephen R. Dow, G. G. Endicott and Chas. L. King, directors. Lands, 2,300 acres, in Section 6, Town 52 North, Range 35 West, and Section 1, 2, 11 and 12, Town 52 North, Range 36 West. Has secured nearly a complete cross section of its lands by 5,000′ of diamond drill borings, and has sunk, crosscut and drifted on several different cupriferous amygdaloids at a variety of points. Shafts 1 and 2 are on the Winona lode, 3 and 4 are on the Shawmut lode and 5 is on an unidentified lode located by diamond drill. Work on No. 5 was discontinued in July, 1903, at depth of 250′. No. 1, the first shaft started by the company, was abandoned at depth of 100′, but was reopened in 1903, owing to the improved showing secured at the Winona. Shaft is 9x14′ in size and is about 500′ in depth, sunk in the footwall of the Winona amygdaloid at an angle of 72°. Having cut good ground drifts were started on the 500′ level late in 1903. Shaft has a duplex hoist, good for 1,000′ depth, also 2 Burt marine boilers and a 4-drill air compressor. Shaft shows epidote, fairly charged with fine copper. Water is pumped from a dam by a Blake pump. Equipment includes a 40x40′ machine shop and smithy, with good equipment, carpenter shop of same size, 28x65′ two-story warehouse, boarding-house with accommodations for 100 men, a schoolhouse and a number of dwellings. No. 2 shaft has a depth of 200′; No. 3, 100′; No. 4, 50′.

ELSIE MINING CO. COLORADO.

Mine office: Winfield, Chaffee Co., Colo. L. J. Reed, superintendent at last accounts. Opened by tunnel. Ores carry gold, silver and copper.

ELSIE ADAIR COPPER MINING CO. AUSTRALIA.

Office: Port Augusta, South Australia. A. M. Hardy, manager. Has steam power and employs about 40 men.

ELY MINE. VERMONT.

Now known as the Copperfield Mines.

EMERALD MINING & SMELTING CO. MEXICO.

Mine office: Santa Catarina del Norte, Baja California, Mex. W. R. Ramsdell, superintendent. Operates La Esmerelda copper mine, opened by shafts. Employs about 75 men.

SOCIEDAD MINERA EMMA LUISA. **CHILE.**

Mine office: Taltal, Antofagasta, Chile. J. S. Marion, superintendent. Has auriferous copper ores, with steam power, and employs about 25 men.

EMMONS MINE. **NORTH CAROLINA.**

Mine office: Lexington, Davidson Co., N. C. Opened before American Civil War; reopened after war; again worked, circa 1891, by a Baltimore company. Has two shafts, 690′ apart, deepest, 460′, on a vein of 3′ to 8′, carrying chalcopyrite.

EMPIRE MINE. **ARIZONA.**

Mine office: Lochiel, Santa Cruz Co., Ariz. Stephen O'Connor, owner. Ores carry copper, silver and lead.

EMPIRE COPPER CO. **NEVADA.**

Lands, near Reno, Washoe county, Nevada, were transferred to Pacific Consolidated Mining Co. Empire company probably dead.

EMPIRE MINES CO. **NEW MEXICO.**

Mine office: Hanover, Donna Ana Co., N. M. J. W. Bible, superintendent. Property is the Ivanhoe mine, having considerable development on a promising ore body. Has steam power and 100-ton concentrator. Supposed to be idle.

EMPIRE MINING CO. **MICHIGAN.**

Office: care of W. K. Prudden, Lansing, Mich. Reincorporated 1899 for 30 years. Lands, 2,100 acres, near Mosquito Lake, Keweenaw county, Michigan. Idle for many years.

EMPIRE SMELTING CO. **ARIZONA.**

Office and works: Benson, Cochise Co., Ariz. R. A. Boggess, president, San Francisco, Cal. Is building a 100-ton smelter to treat custom ores.

EMPIRE TUNNEL & GOLD MINING & MILLING CO. **COLORADO.**

Mine office: Empire, Clear Creek Co., Colo. Frank A. Maxwell, superintendent. Ores carry gold, silver, lead and copper. Has water power and employs 25 men.

EMPIRE GOLD BUG MINING CO. **COLORADO.**

Mine office: Empire, Clear Creek Co., Colo. W. P. Clough, superintendent. Has cupriferous gold and silver ores, and was developing with a small force at last accounts.

EMPIRE & STAR MINING, MILLING & SMELTING CO. **WYOMING.**

Mine office: Hecla, Laramie Co., Wyo. Henry S. Schwartz, superintendent. Ores carry gold, silver and copper. Has steam power, 15 stamps and leaching plant.

ENCAMPMENT MINES CO. **WYOMING.**

Mine office: Encampment, Carbon Co., Wyo. B. E. Burger, superintendent, at last accounts.

ENCENITAS COPPER MINES. **CALIFORNIA.**

Mine office: Encenitas, San Diego Co., Cal.

ENCENITO COPPER CO. **CALIFORNIA.**

Supposed to be in vicinity of San Diego, San Diego Co., Cal., and said to have been building a concentrator at the close of 1903.

and extensive old workings, certainly as old as the Roman and probably dating back in their inception to Etruscan times. During the Nineteenth Century various Italian, French and English parties attempted successively but unsuccessfully to reopen these old mines, which are honeycombed by ancient inclines, adits, drifts, winzes and stopes. The properties were examined by C. Algernon Moreing, Edgar P. Rathbone, R. J. Frecheville, Alexander Hill and J. H. Fawcett. The first named three, who are eminent engineers of the highest professional standing, reported unfavorably. Mr. Moreing stated that "the fact is, that poor as the showing is at the lead and blende mines, it is the only place where ore can be seen at all." Mr. Moreing later stated that the official statements of the company to the shareholders referring to colossal ore deposits are absolutely incorrect, and that there are no such deposits in existence. For these statements the company sued Bewick, Moreing & Co., but dropped the suit for reasons best known to the management. Mr. Rathbone said, "I do not consider that it would be possible to adopt any systematic method of mining which would pay expenses." Mr. Hill, also an eminent engineer, says that the mine might possibly pay with proper development. Mr. Fawcett thought enough of the showing to accept the management of the mine. The company claims to have 4 cupriferous veins, ranging 60′ to 120′ in width, nearly parallel and traceable 1½ miles. Concensus of the best professional opinion as to the effect that the ore bodies, while undoubtedly extensive, are pockety and uncertain, and it is apparent that the principal values were removed by the ancients.

Development by the present company has been carried on at various points. The Walter vertical shaft of 75 metres depth at the Cava del Piombo mine has opened several levels stated to show a vein of 20x15 metres, a section on the third level. This shaft has a 13-metre head-gear with two-cylinder hoist and three boilers. The Grand Cava shaft shows extensive old workings, as, for that matter, do practically all of the new openings. Operations have been suspended on the West vein. The Gov shaft of 100 metres depth shows extensive old workings and little else. The Earle shaft, formerly the Coquand, 90 metres in depth, also shows many old workings. Le Marchant shaft, of 30 metres depth, with an 18-metre drift, shows heavy iron pyrites and a little chalcopyrite with amphibole gangue. While the property is called a copper mine, it seems to be the practically unanimous opinion of experienced engineers, not connected with the company, that the principal values are in lead and zinc, rather than in copper. The reduction plant, with concentrating machinery and smelter rated at about 240 tons daily capacity, has a 100-ton copper furnace, expected to treat about 400 tons weekly of 4% to 5% copper ore. The concentrator was started working on zinc-lead ores about August, 1903. The mines at Temporino and Lanzi are connected by rail with the smelter at Rombola.

An immense amount of money has been spent on this property. Mr. Vavasour Earle, the chairman and principal shareholder, is a cement manufacturer, which does not necessarily imply that he has yet learned all about copper. The statements of the company and its officials seem foggy and contradictory, and the property has been absolutely condemned by three mining engineers of international reputation.

EUREKA GROUP. **CALIFORNIA.**

Office: care of H. F. Dimock, Carrville, Cal. Lands, 2 claims, in Secs. 17 and 18, T. 37 N., R. 7 W., Trinity Co., Cal. Ore is silicious and low-grade. Has a 50′ tunnel.

EUREKA MINE. **HONDURAS.**

A property in the Orica Basin, department of Tegucigalpa, Honduras, which produces gold, silver and copper, the latter in small quantities, as a by-product.

EUREKA GROUP. **VERMONT.**

Mine office: Corinth, Orange Co., Vt. E. L. Smith, general manager. Property includes the Eureka and Union, sometimes known as the Pike Hill mines. Was developing with 15 men at last accounts.

EUREKA CONSOLIDATED MINING CO. **MEXICO.**

Located near the Don Carlos mine, in state of Durango, Mex. Ore from surface assayed 2% copper and about 1 kilo. silver per ton.

EUREKA COPPER CO. **ARIZONA.**

Company moved from 48 Wall St., New York and left no address. Lands, sundry claims 8 miles west of Globe, Gila Co., Ariz., showing a considerable body of low-grade ore.

EUREKA COPPER MINING CO. **WYOMING.**

Mine office: Encampment, Carbon Co., Wyo. H. A. Frambach, president; W. C. Henry, vice-president; O. B. Thompson, secretary; Bernard McCaffrey, treasurer. Lands, 5 claims, area 103 acres, 3 miles southwest of Encampment. Has a 140′ shaft. Supposed to have been a small producer in 1903.

EUREKA DEVELOPMENT CO. **ARIZONA.**

Office: Calumet, Mich. Mine office: Tucson, Pima Co., Ariz. H. T. Allen, superintendent.

EUREKA EXPLORATION CO. **COLORADO.**

Office: Sioux City, Iowa. Mine office: Eureka, San Juan Co., Colo. J. H. Moreland, superintendent. Ores carry gold, silver, lead and copper. Has steam and water power, with 50-ton concentrator, and employs about 30 men.

EUREKA GOLD & COPPER MINING CO. **ARIZONA.**

Mine office: Jerome, Yavapai Co., Ariz. C. W. Woods, president; H. M. Gibbs, secretary and treasurer; Harry Gilmore, superintendent. Lands, 8 claims, near the Iron King and 7 miles south of Jerome, opened by tunnel and showing a promising 30′ vein with an 8′ pay-streak carrying auriferous bornite and chalcopyrite, with occasional visible gold. Has steam power and employs about 20 men. Considering the limited amount of development secured, this is one of the most promising properties in the district.

EUREKA MINING & MILLING CO. **ARIZONA.**

Office: Tombstone, Ariz. Mine office: Naco, Cochise Co., Ariz. Lands, 7 claims, in the Huachuca Mountains, Cochise Co., near the Mexican line. O. B. Steen, president; E. P. Draper, vice-president; F. W. Goodbody, secretary; F. N. Wolcott, treasurer; E. A. Hockley, superintendent. Copper Glance group, opened by tunnels, has shipped more than $100,000 worth of ore and concentrates, these giving smelter returns of about $150 per ton, averaging 27% copper, $6 gold and 184 oz. silver per ton. Eureka group has produced about $15,000 worth of ore. Company is managed by men of good standing, and property is considered valuable.

EUREKA MINING, SMELTING & POWER CO. **OREGON.**

Office: Lewiston, Idaho. Mine office: Imnaha, Wallowa Co., Ore. G. A. Nehrhood, superintendent. Has a 10′ ore body carrying auriferous and argentiferous chalcopyrite giving good assay values, with steam power and a $65,000 smelter completed in 1903, and employs about 50 men.

EUREKA HILL MINING CO. **UTAH.**

Mine office: Eureka, Juab Co., Utah. Geo. W. Riter, secretary and manager. Ores carry silver, lead, gold and copper. Has steam power and 100-stamp mill, employing upwards of 100 men.

EUREKA MABEL MINE. **ARIZONA.**

Mine office: Patagonia, Santa Cruz Co., Ariz. W. A. Balcom, superintendent. Made a carload shipment of hand-sorted ore carrying argentiferous galena and gray copper, late in 1903.

EUREKA-OPHIR MINES. **UTAH.**

Office: care of J. W. Cairns, Stockton, Utah. A body of high-grade ore was encountered in this property in the spring of 1903.

EUSTIS MINING CO. **QUEBEC.**

Mine office: Sherbrooke, Sherbrooke county, Quebec.

EVANGELINA COPPER MINING CO. **MEXICO.**

Office: 204-202½ So. Broadway, Los Angeles, Cal. Mine office: Santa Catarina, Ensenada de Todos Santos, Baja California, Mex. D. R. Wilder, president; J. H. Coleman, vice-president; Josephine H. Wilder, secretary and treasurer; C. L. Ripperdan, superintendent. Lands, about 150 acres, showing outcrops of 15% ore. A fissure vein opened ranges from a few inches to 6′ wide.

EVANS-TANZER CONSOLIDATED COPPER CO. **CALIFORNIA.**

Mine office: Lavic, San Bernadino Co., Cal. Chas. Tanzer, vice-president; F. H. Lerchen, metallurgist and mining engineer. Said to have erected a roasting furnace to operate on a new system.

EVELYN MINING & LEASING CO. **COLORADO.**

Office: Leadville, Lake Co., Colo. Morris Sterne, manager. Ores carry gold, silver, lead, copper and zinc. Has steam power and employs about 40 men.

EVENING STAR MINING CO. **WYOMING.**

Mine office: Riverside, Carbon Co., Wyo. J. H. Bills, superintendent, at last accounts. Lands, in the Beaver Creek district of Carbon County.

Mine is opened by an 800′ crosscut tunnel, and is developing a wide vein with a 2′ pay-streak carrying very high-grade chalcocite, malachite and melaconite.

EVERETT MINE. **NORTH CAROLINA.**

Presumably in the Virgilina district of North Carolina. Some machinery was installed in 1902, and owners claimed to have 560,000 tons of 6% ore blocked out, which was probably an overestimate of both quantity and quality.

EVERGREEN BLUFF MINE. **MICHIGAN.**

Lies south of Adventure and Mass mines, in Ontonagon county, Mich. Worked 1854-1863, producing 675 tons 1,174 lbs. refined copper, at a cost of $223,582.24.

EXCELSIOR COPPER CO. **ARIZONA.**

Office: 421 Olive St., St. Louis, Mo. Lands, near Pima, Pima Co., Ariz. Promoted by the notorious Wm. F. Wernse & Co., Bond & Stock Co., of St. Louis, Mo. This firm has put out immense quantities of alleged mining stock, all of which, as far as can be learned, is utterly worthless. Firm has been convicted of using the United States mails for fraudulent purposes.

EXCELSIOR COPPER & GOLD MINING CO. **WYOMING.**

Mine office: Aetna, Carbon Co., Wyoming.

EXCELSIOR MINING CO. **NEW MEXICO.**

Letter returned unclaimed from former mine office, Organ, Donna Ana Co., N. M. Gilbert E. Dunbar, owner; Chas. M. Jewell, superintendent. Has argentiferous copper ore and gasoline power.

EXCELSIOR MINING & SMELTING CO. **NEVADA.**

Office: Butte, Mont. Letter returned unclaimed from mine office, Yerington, Lyon Co., Nev. John F. Forbes, president; Frank E. Shaw, secretary. Capitalization, $200,000. Property is the Bluestone mine, opened by tunnels, equipped with steam and gasoline power, and having oxide and carbonate ores said to average 10% copper. Has a 150-ton water-jacket furnace, installed 1901. Property idle.

EXCHANGE GOLD & COPPER MINING CO. **ARIZONA.**

Said to have 20 claims in vicinity of Flagstaff, Coconino Co., Ariz. Letters to former office, Nevada Blk., San Francisco, returned unclaimed.

COMPANIA EXPLOTADORA DE PARRAL. **MEXICO.**

Mine office: San Bartolo, Durango, Mex. Operates El Lentisco mine, producing gold and copper, and employed about 40 men at last accounts.

FAEO GRUBE. **NORWAY.**

A group of small Norwegian mines, producing a limited quantity of ore averaging 4% copper.

FAIRVIEW MINING CO. **MONTANA.**

Mine office: Basin, Jefferson Co., Mont. Timothy Downey, superintendent. Ores carry gold, silver and copper. Mine is opened by shaft and tunnel, and has steam power.

FALERZ-UND-KUPFERKIESBERGBAU. **AUSTRI**

Mine office: Altzech Zapfenschuh, Tyrol, Austria. A small produ of sulphide copper ore.

FAMATINA COPPER & GOLD SYNDICATE, LTD. **ARGENTIN**

Offices: 66, Cannon St., London, E. C., Eng. A. Dangerfield, sec tary. Capital, £10,025, in 10,000 £1 ordinary shares and 500 £1 founde shares, latter to take half the profits after dividends aggregating 20% ha been paid on ordinary shares. Is the parent company of the Famati Development Corporation, Ltd.

FAMATINA DEVELOPMENT CORPORATION, LTD. **ARGENTIN**

Offices: 66, Cannon St., London, E. C., Eng. Mine offices: Chilecit Rioja, Argentina. Hermann Pape, chairman; A. Dangerfield, secretar Florence O'Driscoll, engineer. Registered Jan. 21, 1903, with a nomina capital of £400,000, to take over mining lands from the Famatina Coppe & Gold Syndicate, Ltd. Property is in the Famatina mountains of th Mexicana district of Rioja, Argentina, showing 14 auriferous and argenti ferous copper veins averaging about 4′ width and claimed to be 2 mile in length. Smelter-site is at Chilecito, 25 miles from mine, and a 25-mil aerial tram is planned to connect the mine and works. It is estimated that this tram should cut the cost of transportation from the present figur of 35s. down to 25s. per ton. The Cordova Central railroad is to be extended to the district, touching the smelter-site. Water is abundant and wages are about 30c. per day, for natives, whose labor is correspondingly efficient. Company makes extensive claims as to the value of its property.

COMPANIA MINERA FARELLON. **CHILE**

Mine office: Puquios, Copiapo, Atacama, Chile.

FARGO GOLD & COPPER MINING CO. **OREGON**

Office: Fargo, N. D. Mine office: Imnaha, Wallowa county, Ore. H. M Peterson, president; J. A. Husebye, secretary and treasurer; Charles Wallace superintendent. Operates the Last Chance mine, producing auriferous an argentiferous copper ores. Has water power and employs about 25 men Ore is to be reduced by the smelter at the Eureka mine, adjoining.

FARO COPPER CO. **MONTANA**

Absorbed by Pittsburg & Montana Copper Co.

FAUQUIER COPPER CO. **VIRGINIA**

Supposed to be developing a copper property in Fauquier Co., Va H. A. Palmer, superintendent, at last accounts.

FAVORITE GOLD & COPPER MINING CO. **WASHINGTO**

Office: Nelsonville, Ohio. Mine office: Nighthawk, Okanogan Co Wash. Employs 6 to 10 men. Organized Sept. 25, 1902, with capitaliz tion $2,000,000, shares $1 par. J. M. Parker, president; J. F. Baldrid secretary; H. D. James, general manager; Myron J. Church, mine superi tendent. Lands, 16 claims, area about 300 acres, adjoining the Nighthaw mine, on Mt. Ellemeham, in the Wanicutt Lake district, showing 5 vei of which one, ranging 1′ to 5′ in width, is opened by an 850′ tunnel showi values in copper, gold, silver and lead, principally the former. Nearest railroad is the Canadian Pacific, 34 miles distant.

LA FE MINE. **MEXICO.**

Mine office: Jimulco, Coahuila, Mex. Pearson & Randall, owners; Geo. Pearson, manager. Ores carry copper, gold and silver.

FEDERAL COPPER CO. **MICHIGAN.**

Office: 207 First Nat'l Bank Bldg., Duluth, Minn. Organized 1902, under laws of Minnesota, with capitalization $600,000, shares $10 par. P. L. De Voist, president; F. D. Adams, secretary and treasurer. Lands, 360 acres, adjoining the Miskwabik, in Houghton township, Keweenaw county, Michigan. Property is supposed to carry the northern extension of the Kearsarge amygdaloid.

FEDERAL COPPER CO. **WYOMING.**

Letter addressed to Laramie, Wyo., returned unclaimed. Company supposed to have lands in Carbon county, Wyoming.

FEDERAL COPPER CO., LTD. **ARIZONA & WISCONSIN.**

Office: 214 Lumber Exchange, Minneapolis, Minn. C. S. Dudley, president. Organized under laws of Arizona, with capitalization $500,000, shares $1 par. Lands, 520 acres, 6 miles southeast of Superior, Douglas Co., Wisconsin; 600 acres in the St. Croix Valley, Burnett Co., Wis., and sundry claims in Arizona, the latter presumably a gold mine.

FEDERAL COPPER MINING & SMELTING CO. **ARIZONA & NEW MEXICO.**

Works office: El Paso, Texas. F. H. Wilson, president; J. Geo. Hilzinger was appointed receiver, September, 1903. Property is a smelter at El Paso, with a blast-furnace and converter of about 100 tons daily capacity, employing about 80 men when running, also mineral lands in the Organ Mountains, Donna Ana county, New Mexico, and a controlling interest in the Dragoon Mining Co., at Johnson, Cochise county, Arizona.

FEDERAL GOLD & COPPER CO. **NEVADA.**

Office: 214 Lumber Exchange, Minneapolis, Minn. Mine office: Dayton, Lyon Co., Nev. C. S. Dudley, president. Has same address and president as Federal Copper Co., Ltd. Lands, 7 claims, in the Como district, supposed to include the Como-Eureka mine, showing 4 parallel veins giving estimated average values of about $15 per ton. Has a 100-ton concentrator, operated by electricity generated at the Dayton river, 8 miles distant, where the old Douglas mill has been leased for a power-house, and supplied with a 250-h. p. generator.

FEDERAL GOLD & COPPER MINING CO. **UTAH.**

Office: 612 McCornick Bldg., Salt Lake City, Utah. Mine office: Blue Acre, Beaver Co., Utah. Organized Jan. 20, 1903, under laws of Utah, with capitalization $1,000,000, shares $1 par. Hon. Heber Wells, president; A. Stuart, secretary; E. W. Young, general manager; W. A. Wilson, engineer. Lands, 9 patented claims. area 180 acres, in the Beaver Lake district, showing a number of fissure and contact veins in country rocks of granite-porphyry, quartzite and limestone, opened by a 40′ tunnel and

9 pits and shafts, deepest 80′. Was discovered and worked many yea ago, producing about $100,000 worth of ore, but was long idle until take over by present company. Diamond drill borings are to be made in 1904.

FEDERAL MINES CORPORATION. **COLORAD**

Mine office: Idaho Springs, Clear Creek Co., Colo. H. A. Moore, supe intendent. Ores carry gold, silver, lead and copper. Has steam powe and employs about 20 men.

FEDERAL MINING CO. **ARIZON**

Office: 29 Broadway, New York. Mine office: Safford, Graham Co Ariz. Employs 24 men. Francis H. Wilson, president; H. E. Hutchinso treasurer; John F. Weber, general manager; Chas. Allin, engineer. O ganized 1902, under laws of Delaware, with capitalization $1,000,000, shar $10 par. Lands, 24 claims, area 470 acres, also a 5-acre millsite, in the Lo Star district, showing three ore bodies of about 9′ average width carryi oxide, carbonate and sulphide ores, latter below the 300′ level. Mine opened by shafts of 130′, 325′ and 425′ and by tunnels of 90′, 100′ and 30 Three shipments of ore aggregating 75 tons gave smelter returns of 24% 28% and 30% copper, with about 2 oz. silver and 80c. gold per ton. Ha gasoline and steam power and plans building a 50-ton concentrator on the San Juan claim. Ignatius L. Qualey, former general manager, and Frank S. Weller, former secretary, are in the penitentiary for fraud. Company removed from former office at 1112 Park Row Bldg., New York, and left no address behind, so that any mail addressed there, containing bills, etc. was returned unclaimed.

SOCIETA DELLA FENICE MASSETANA. **ITALY.**

Mine office: Massa Maritima, Grosseto, Italy. Veins or lenses range from 6″ to 20 metres in width, carrying chalcopyrite associated with iron pyrites in a quartz gangue, and showing occasional native copper. First-grade ore, averaging about 11% copper, is heap-roasted at the mine and smelted at Leghorn, and the second-grade ore, averaging about 3% copper only, is heap-roasted and leached at the mine.

FENOCHIA MINING CO. **MEXICO.**

Mine office: Magdalena, Sonora, Mex. Juan Fenochia, manager. Development is by shaft and tunnel. Employed about 20 men at last accounts.

FENTRESS MINING CO. **NORTH CAROLINA.**

Office: 52 Broadway, New York. Mine office: Center, Guilford Co., N. C. Henry J. Dexter, president; Chas. W. Scott, secretary. Main shaft, 178′. Is an old mine, recently reopened. Has steam power, with 10-stamp mill running on cupriferous gold ores, and contemplates adding 20 stamps.

FERNANDO MINING CO. **MEXICO.**

Office: 12 Ashburton Place, Boston, Mass. Mine office: San Fernando, Durango, Mex. Col. T. L. Livermore, treasurer; Courtney de Kalb, manager. Ores carry gold, silver and copper. Has water and electric power, with concentrator, and employs about 250 men.

FERRIS-HAGGARTY COPPER MINING CO. **WYOMING.**

Absorbed by North American Copper Co.

COMPANIA DE MINAS FERROCOBRIZAS. **SPAIN.**

Office: San Isidro, 16, Sevilla, Spain. Mine office: Cortegana, Huelva, Spain.

FIDELITY MINING CO., LTD. **MICHIGAN.**

Office: care of I. P. Griswold, chairman, Allegan, Mich. Organized February, 1903, with capitalization $300,000. Lands, in Section 15, T. 50 N., R. 40. W., 2½ miles northwest of Victoria mine, in Ontonagon county, Michigan.

MINA FILOMENA. **CHILE.**

Mine office: Chañaral, Atacama, Chile. Baldomero Luna, owner; N. Rojas, superintendent. Has steam power and employs about 50 men.

FINLETTER & HARVEY. **ARIZONA.**

Mine office: Globe, Gila Co., Ariz. Firm has made a number of small shipments of high-grade ore, giving average returns of 22% to 27% copper, to El Paso smelters.

FINLEY GOLD & COPPER MINING & MILLING CO. **UTAH.**

Mine office: La Sal, Grand Co., Utah. C. A. Finley, general manager. Lands, 3 claims at the foot of Horse Mountain carrying ores giving smelter returns of $32.40 per ton from small shipments.

FITZROY COPPER MINES, LTD. **AUSTRALIA.**

Offices: 70, Bishopsgate St., London, E. C., Eng., and 79 Pitt St., Sydney, N. S. W., Australia. Mine office: Mt. Chalmers, Queensland, Australia. P. Charles, chairman; O. G. Parker, secretary; W. H. Edwards, manager. Registered August 15, 1902. Capital, nominal, £13,000. Property is the Mt. Chalmers mine, area 140 acres, near Rockhampton, Queensland, reopened October, 1902, after many years' idleness. Ores carry copper, gold and silver. Has steam power, 60-ton smelter and 20-stamp mill with vanners. Employs about 50 men.

FIVE METALS MINING CO.

Correct title is North Arkansas Zinc, Copper, Lead, Silver & Gold Mng. Co.

FLINT STEEL MINE. **MICHIGAN.**

A tract of 400 acres, near the Michigan mine, in Ontonagon county, Mich. Produced 415 tons, 458 lbs. refined copper, at a considerable loss. Idle since circa 1875.

FLORENCE MINING, MILLING, SMELTING & REFINING CO. **COLORADO.**

Office: Florence, Colo. Lands, 18 claims, in Custer county, Colorado, showing a small vein giving good assays in copper.

FOND DU LAC MINE. **WISCONSIN.**

A prospect in Douglas county, Wisconsin, on which two shafts, deepest 65', were sunk in 1899, giving a fine showing of native copper rock, said to have been brought from Michigan for the purpose.

FORAN MINE. **ARIZONA.**

Office and mine: Stoddard, Yavapai Co., Ariz. Samuel Foran, owner. A prospect on which a limited amount of development work has been secured

D COPPER CO. **COLORADO.**

Letter returned unclaimed from former mine office, Georgetown, Colo. perty is in Eldorado county, Colo. Ore values are in gold and copper, er predominating.

EST MINE. **WASHINGTON.**

Mine office: Darrington, Snohomish Co., Wash. Thos. Parks, superndent. A prospect, opened by tunnel.

EST HILL CONSOLIDATED MINING & MILLING CO. **COLORADO.**

Office: 420 Exchange Bldg., Denver, Colo. Mine office: Tin Cup, Gunni- Co., Colo. L. Cavnah, president; J. C. Jensen, secretary and superndent. Has steam power and two-stamp mill. Company has been avoring for many years to develop a gold, silver, lead or copper mine, in Cup and elsewhere.

TUNA GROUP. **CALIFORNIA.**

Office: care of E. G. Harrison, owner, Callahan, Cal. Lands, in Siskiyou nty, Cal. Ore is chalcopyrite associated with pyrrhotite, traversing ite. Has a limited amount of development work, by shafts.

IPANIA MINERA LA FORTUNA. **MEXICO.**

Mine office: Tepezalá, Aguascalientes, Mex. Geo. B. Wardman, superndent. Operates La Fortuna and adjoining mines, opened by shaft, lucing copper and silver. Uses animal power and employs about 150 .

TUNA MINING CO. **CALIFORNIA.**

Office and mine: Fortuna, Trinity Co., Cal. C. Sweet, president. La npatented claims, in Trinity county, near Humboldt county line, C ia. Was developing with small force at last accounts.

TUNA GRANDE COPPER CO. **NEVAD**

Mine office: Ely, White Pine Co., Nev. Property includes the Pil b group, carrying auriferous copper ores. Has steam power and work o 15 men.

TUNE COPPER & FINANCE CO.

Offices: 10, Basinghall St., London, E. C., Eng. Registered July 22, . Capital, nominal, £25,000. No information obtainable regarding pany's lands, if any are owned.

TUNE MINING & MILLING CO. **UTAH.**

Mine office: Bingham Canyon, Salt Lake Co., Utah. Elmer Hill, presi- . Ores average 4% to 8% copper, with gold, silver and lead values. e is opened by shaft and tunnels. Has steam and electric power, and on concentrator. Mine is under lease to the Bingham Consolidated began shipping ore to smelter, November, 1903.

TY-FIVE CONSOLIDATED MINING CO. **WASHINGTON.**

Mine office: Silverton, Snohomish Co., Wash. Property is in the Monte to district, and is very much tangled up in litigation.

TY-SEVEN MINE. **WASHINGTON.**

Letter returned unclaimed from mine office, Index, Snohomish Co., sh. H. McKinnon, owner. Has argentiferous copper ores

FOUR B'S MINING CO. **COLORADO.**

Mine office: Turret, Chaffee Co., Colo. David Allen, superintendent. Operates the Jasper mine, carrying ores of gold silver and copper. Has gasoline power.

FOUR BROTHERS COPPER MINE. **WASHINGTON.**

Mine office: Silverton, Snohomish Co., Wash. Lands, 4 claims, having about 500′ of development work, mainly tunnels, showing ores carrying copper, gold and silver.

FOUR METALS MINING CO. **ARIZONA.**

Office: 21 South Center St., Phoenix, Ariz. Has lands somewhere in Southern Arizona said to give ores carrying gold, copper, silver and lead.

FOUR METALS MINING CO. **COLORADO.**

Office: Equitable Bldg., St. Louis, Mo. Mine office: Silverton, San Juan Co., Colo. Organized Jan. 17, 1899, under laws of Colorado, with capitalization $2,000,000, shares $1 par; issued, $1,500,000. W. Frank Carter, president; R. M. Scruggs, secretary and treasurer; Joseph H. Shockley, superintendent. Lands, 47 claims, area 516 acres, at Silverton, San Juan county and Telluride, San Miguel county, Colorado. Supposed to have a mill under construction at the Palmyra mine, and a steam plant at the Andrus mine, in Ingraham basin, near Telluride.

FOUR METALS MINING CO. **UTAH.**

Office: care of G. L. Moats, general manager, Salt Lake City, Utah. H. Hugo Brandeis, president; R. P. Hill, secretary. Lands are in the Dugway or Deep Creek district of Utah, and carry auriferous, argentiferous and cupriferous zinc and lead ores. Mine is opened to depth of 400′ and equipped with a 50-ton concentrator.

FOURTH OF JULY MINING & MILLING CO. **COLORADO.**

Mine office: Eldora, Boulder Co., Colo. J. B. Johnson, superintendent. Developed by shafts and a 220′ tunnel planned to cut the Olympic and Fourth of July veins, from which assays of 25% to 45% copper, some lead, 50 to 125 oz. silver and $30 to $60 gold per ton have been secured. Employed 15 men at last accounts.

DUNCAN FOX Y CA. **CHILE.**

Mine office: Cobija, Tocapella, Antofagasta, Chile. Firm owns a large number of copper claims near Cobija, and elsewhere, in the Tocapella district of Antofagasta province.

COMPAGNIE FRANCAISE DES MINES DE CUIVRE D'AGUAS TENIDAS. **SPAIN.**

Offices: Rue de Chateaudun, 39 bis, Paris, France. Supposed to be developing Spanish copper mines, but no returns secured respecting operations or location of property.

COMPAGNIE FRANCAISE DES MINES DE CUIVRE D'AKHTALA. **RUSSIA.**

Offices: Rue Tronchet, 27 bis, Paris, France. Owns copper properties in the Russian Caucasus, supposed to be undergoing development on a limited scale.

SOCIETE FRANCAISE DES PYRITES DE HUELVA. **SPAIN.**

Offices: Rue de Chateaudun, 39, Paris, France. Mine office: Valdelamusa, Huelva, Spain. Property includes the Perrunal mine, which produces mainly cupriferous iron pyrites rich in sulphur.

SOCIETE FRANCAISE MINIERE ET METALURGIQUE EN SERBIE. **SERVIA.**

Offices: Rue de Courcelles, 147, Paris, France. Lands are in Servia. Cannot be learned that work is in progress.

ANDRES FRANCHY. **PERU.**

Mine office: San Marcelo, Yauli, Peru. Mines silver-copper ores.

SOCIETE MINIERE ET METALURGIQUE FRANCO-ESPANGNOLE. **SPAIN.**

Offices: Rue de Lisbonne, 8 bis, Paris, France. Location of mines in Spain not learned.

COMPANIA MINERA FRANCO-GALLEGA. **SPAIN.**

Mine office: Monforte, Lugo, Spain.

FRANKLIN MINING CO. **MICHIGAN.**

Office: 15 Congress St., Boston, Mass. Mine office: Hancock, Houghton county, Mich. Employs about 600 men. Organized April 3, 1857, under laws of Michigan; reincorporated, 1887, for 30 years, capitalization since increased to $2,500,000, shares $25 par. Francis H. Raymond, president; Daniel L. Demmon, secretary and treasurer; Joshua D. Hosking, superintendent; F. H. Raymond, D. L. Demmon, Geo. H. Flint, Josiah Q. Bennett and Joshua D. Hosking, directors; Cyrus Truan, mining captain at old Franklin; John Doney, mining captain at Franklin Junior; Arno Jaenig, clerk; Edward Warne, mill superintendent.

Official returns to the state of Michigan, as of date Jan 1, 1903, disclose the following figures:

Amount cash paid in on capital stock	$1,040,333.[illegible]
Entire amount invested in real estate 1894-1898	54,901.[illegible]
Amount of personal estate	234,274.[illegible]
Amount of unsecured or floating debt	91,304.[illegible]
Production of copper, 1902	5,259,140 lbs.

Amount paid in by conveyance of property unknown, as books were burned.

The following table gives comparative figures of operations and finances for three years:

	1902	1901	1900
Production of mineral, lbs	8,352,020	5,471,272	4,641,7[illegible]
Production of refined copper, lbs	5,259,140	3,757,419	3,663,71[illegible]
Received from copper sales	$ 631,768	$ 494,436	$ 594,2[illegible]
New stock issued	....	300,000	....
Cash on hand	15,247	32,908	....
Received from silver sales	949	700	....
Total receipts	$ 647,964	$ 828,045	$ 594,2[illegible]

General expenses	$ 521,432	$ 546,788	$ 582,785
Smelting, freight, insurance, etc	76,833	51,510	63,908
Construction charges	....	....	9,639
Loans paid	....	214,500	....
Total expenses	598,270	812,798	656,332
Surplus	49,694	15,247	62,080

Lands, 160 acres at the old Franklin; 1,359 acres of surface, also mineral rights to 160 acres, at the Franklin Junior, and a millsite of nearly 200 acres at Grosse Pointe with one mile frontage on Portage Lake. The old mine consists of the southwest quarter of Section 2, Town 55 North, Range 33 West. The Junior mine was opened in 1860 as the Albany & Boston, was renamed the Peninsula in 1882 and was bought by the Franklin in 1895. The old Franklin is opened on the Pewabic lode and is surrounded on three sides by the Quincy mine, which has cut off the Franklin from following the amygdaloid beyond the boundary line. The old Franklin is producing about 375 tons of rock daily, from shaft No. 3, which is 3,200′ deep, and No. 5, which is 2,850′ deep, both bottomed at the Quincy line. Mining is almost entirely scramming old ground and robbing pillars, only 502′ of drifting having been done in 1903. Several of the lower levels have been gutted, and the remaining pillars will be sliced down, working upward. Production is chiefly from ground between the 10th and bottom levels north of No. 5 shaft, which has considerable tributary territory not opened, ground having been left untouched because of low values. The pillars removed are usually of good grade, but the reworked ground varies greatly, ranging from the best grade of stamp rock and heavy copper down to nearly absolute worthlessness. A little native silver is produced by the Pewabic lode, this being picked out by boys in the stamp-mills. The mine employs about 50 power drills, approximately 20 at the old mine and 30 at the Junior. The Franklin company has expended about $2,200,000 in developing and equipping the Franklin Junior mine and the new stamp-mill.

The Franklin Junior has two separate mines, these being the old Albany & Boston, on the Allouez conglomerate, which is the mine now worked, and the mine opened on the Pewabic amygdaloid several years ago, the latter lying 475′ west of and parallel with the first-named mine. The amygdaloid shafts are numbered from north to south. The north shaft is about 900′ south of the Rhode Island line and approximately 1,000′ deep; No. 1 is 1,100′ next south and is about 1,600′ deep; No. 2 is 1,500′ further south and about 1,200′ deep; No. 3 is 1,100′ next south and is about 400′ in depth. The four shafts are sunk at an angle of 48° 30′, on a lode varying in width from 3′ to 15′ and averaging probably 9′. Average returns secured from this lode were only about 0.45% or 9 lbs. refined copper per ton of rock crushed, hence the amygdaloid shafts were abandoned February, 1902, but at 2,000′ to 2,500′ depth a crosscut may be sent to the amygdaloid from the conglomerate workings.

The results given by the Pewabic amygdaloid were so unsatisfactory that the old Albany & Boston mine, on the Allouez conglomerate was reopened in 1900. No. 1 shaft was cut down to three-compartment size, 7x20′ over all, with inside measurement of 6′ 6″x18′ 6″. This shaft has a direct hoist, good for one mile depth and raising 6-ton skips. Water is forked from the conglomerate openings by a Cornish pump with 10″ lift, the largest of this style in the Lake district, which is probably handling water as cheaply per foot-gallon as any pump in Michigan. No. 1 shaft was 1,700′ deep at the close of 1903.

No. 2 shaft is located 1,200′ south of No. 1 and is 7x18′4″ over all and 235′ in depth. The shaft is sunk in the footwall 3′ under the lode, to secure firm walls, and was started July 1, 1903. It will be deepened by sinking and raising simultaneously from the surface and the seventh and fourteenth levels, and should be completed in the summer of 1904. No. 2 shaft is to have a rockhouse bought from the Arcadian, with a straight-drum duplex-cylinder hoist good for depth of about 1,300′. About 3′ to 5′ of lode rock is left unmined on the hanging wall and no assortment of rock attempted. The conglomerate is very regular in its copper contents, unlike the same lode to the northward, at the Allouez, where it is decidedly bunchy. In 1903 the Franklin Junior sunk 395′ of shafts and opened 4,903′ of drifts. The lode averages 18′ to 22′ in width with an extreme width of about 30′. The combination shaft-rockhouse at No. 1 is 40′x50′ on the ground and 96′ high. Surface equipment includes air compressors of 10, 12 and 36 drill capacity. On surface there are substantial and well-equipped machine, carpenter and blacksmith shops, an office, changing house and a considerable number of comfortable dwellings.

In addition to the Allouez conglomerate and Pewabic amygdaloid, the Franklin Junior tract carries the Mesnard epidote, Calumet conglomerate and Osceola and Kearsarge amygdaloids, all opened by a 975′ cross-cut sent west from the Pewabic lode, this showing several amygdaloids and one conglomerate carrying copper in unpromising quantities. The formation is found considerably disturbed at that depth and a deeper cross-cut may be driven eventually.

The stamp-mill, at Grosse Pointe, is served by the Mineral Range railroad. The building is of steel, on stone foundations, 177x194′ in size, and has a self-supporting, brick-lined smokestack of 7′ diameter standing 165′ high on a 52′ brick foundation. The mill has four Allis-Chalmers heads, the fourth and last having been put into commission Nov. 27, 1903. Each head treats about 350 to 375 tons daily, equal to crushing 450 to 500 tons of the much softer amygdaloid rock. The three older heads are being overhauled and all four will go into full commission when No. 2 shaft at the Junior begins production. The mill has rock-bins of 1,000 tons capacity for each head. The heads are equipped with hydraulic separators, which take out considerable heavy copper. Each head has 20 rough jigs, 15 finisher jigs, 6 round tables and one Overstrom table. The jigs are of the Hodge eccentric type with center-shield copper discharges which obviate skimming. The mill has a 16x22″ Allis-Chalmers engine with steam supplied by two 500-h. p. Stirling water-tube boilers. Water is furnished by an Allis-Chalmers 15,000,000-gallon vertical compound pump, with 21x42" high-pressure cylinders and 42x42" low-pressure cylinders, with plungers 37½" in diameter and 42" stroke. Water is drawn through a 36" pipe line running 200' into the lake to a crib protected by quarter-inch screens. The mill has a 5x12" duplex fire pump with a full outfit of hose and a complete electric light plant. There is a 267' wharf at the millsite, with 18' of clear water alongside, this having coal-hoists and coal-sheds. There are about 20 dwellings at the millsite. The conglomerate rock is the most refractory in the lake district, the average life of a stamp-shoe being but 2 days and 7 hours, but milling costs for 1902 were only 28.81c. per ton.

About one-third of the rock stamped is supplied by the old mine and about two-thirds by the Junior. The combined rock from both mines gives average returns of a trifle under 1.25% mineral, which carries about 60% of fine copper, giving a scant 0.75% of refined copper, equal to 14 to 15 lbs. per ton of rock stamped. Production for 1902 was 5,259,140 lbs. and for 1903 was about 5,320,000 lbs. of refined copper. The cost of copper is stated by the company to be about 11c. per lb. but this figure probably does not allow for repairs, replacements and depreciation which must be considered in any final table of costs. The copper is wisely sold, at current market prices, as produced. The property is being handled with great vigor and the highest degree of economy. Considering the refractory nature of the rock and its exceeding leanness, the results secured by Capt. Hosking during the past three years are little short of marvelous.

FRASER MOUNTAIN COPPER CO. **NEW MEXICO.**

Office: Asbury Park, N. J. Mine office: Twining, Taos Co., N. M. Organized 1901, under laws of New Mexico, with capitalization $1,000,000, shares $1 par; also has bond issue of $150,000. Albert C. Twining, president; Wm. Fraser, vice-president and general manager; H. S. Taylor, secretary; Ralph R. Knowles, superintendent. Lands, 400 acres, partly patented, also a 7-acre millsite and 800 acres miscellaneous lands, in the Rio Hondo district, carrying 3 fissure veins partly developed, main vein being 50' to 60' wide and traceable 1,000', showing oxide, carbonate and sulphide ores. Development is by several shallow shafts and 6 tunnels. Equipment includes water-wheel, air compressors, electric lights, shops, hotel and general store. Has a 100-ton concentrator and 125-ton smelter. Ores are claimed to average 4% copper, with good gold and silver values. Company has recently come to grief financially, and Frank Stoplin appointed receiver. Twining is under indictment in New Jersey. Property thought to be of value if properly developed and honestly managed.

FREE CUBA MINE. **CALIFORNIA.**

Office and mine: Acton, Los Angeles Co., Cal. Ira L. Houser, owner. Mine opened, circa 1860. Has quartz vein 23' wide, with 5' pay-streak carrying native copper and high-grade ore. Has steam power and employs 10 to 15 men.

FREEHOLD MINE. **AUSTRALIA.**

Mine office: Newellton, Queensland, Australia. Ore carries 10% to 30% copper and 12 to 30 oz. silver per ton.

FREELAND CONSOLIDATED MINES CO. COLORADO.

Mine office: Idaho Springs, Clear Creek Co., Colo. Geo. E. McClellan, superintendent. Ores carry gold, silver, lead and copper. Has electric power and employs about 50 men.

FREELAND EXTENSION MINING & MILLING CO. COLORADO.

Mine office: Idaho Springs, Clear Creek Co., Colo. Jas. A. Wilson, superintendent. Ores carry gold, silver, lead and copper. Has gasoline power and employs a small force.

FREELAND MERCANTILE & MINING CO. COLORADO.

Mine office: Freeland, Clear Creek Co., Colo. W. N. Smith, superintendent. Mine is opened by shafts and tunnels and has steam power. Ore carries gold, silver, copper and lead.

FREMONT COPPER MINING CO. WYOMING.

Office: Fremont, Neb. Mine office: Riverside, Carbon Co., Wyo. Thos. Carroll, secretary and superintendent. Lands, in Purgatory Gulch, Carbon county. Has steam power and a 225′ incline shaft, from which ore giving good assays has been secured.

FRENCH CREEK MINES. PENNSYLVANIA.

An old copper property in Chester Co., Pa. Long idle.

FRESNO COPPER CO., LTD. CALIFORNIA.

Office: 188, St. Vincent St., Glasgow, Scotland. Mine office: Clovis, Fresno Co., Cal. J. H. M. Graham, chairman; H. Grafton Vercoe, managing director at mines. Registered April 2, 1902, by Californian Copper Syndicate, Ltd., with capital, nominal, £175,000. Lands, 5 claims, area 80 acres, near Pollasky, showing a vein said to be 50′ wide, on which four shallow shafts have been sunk, showing ores assaying up to 7% copper and $2 gold per ton. Has steam power and employs about 40 men.

FRIDAY & LOWDEN GROUP. CALIFORNIA.

Office and mine: Redding, Shasta Co., Cal. Has a limited amount of development by tunnels.

COMPANIA MINERA LA FRONTERIZA. MEXICO.

Mine office: Cerralvo, Nuevo Leon, Mex. Ores carry silver and copper. Was working about 25 men at last accounts.

FUKADA MINE. JAPAN.

Mine office: Fukada-mura, Kuma-gori, Higi, Japan. Country rocks are alternate strata of sandstone and clay-slate of the paleozoic group, ore body having strike and dip corresponding to country rocks, and ranging 5′ to 10′ in thickness. Ore is chalcopyrite, associated with iron pyrites, and averages 5% to 6% copper. Yield in 1900 was 18,266 lbs. refined copper.

FULTON MINE. COLORADO.

Said to be located 9 miles from Ribera, Colo. Letter to that address returned unclaimed. Shipped several carloads of high-grade ore to smelter at Cerillos, during 1902.

FUNATSU GROUP. JAPAN.

Mine office: Funatsu, Hida, Japan. Ores produce both silver and copper, annual production of latter averaging about 200 tons.

SOCIEDAD DE MINAS Y FUNDICION. CHILE.

Mine office: Carizal Alto, Freirina, Atacama, Chile. Operates the Portozuelo, Armonia and 12 other mines. The Armonia, about 1,200′ in depth, has long been a considerable producer.

FUNDICION TEMPLEMAN, LTD. CHILE.

In voluntary liquidation. J. G. Fowler, liquidator, 3, Frederick's Place, Old Jewry, London, E. C., Eng. Property includes smelters at Antofagasta, Chile, also the Atahualpa mine, at Pica, Tarapaca, Chile, and others.

COMPANIA MINERA FUNDIDORA Y AFINADORA. MEXICO.

Office: Monterey, N. L., Mex. Mine office: Panuco de Coronado, Durango, Mex. Operates La Cruz y Anexas mines, producing silver, lead and copper, and employing about 50 men.

DWIGHT FURNESS CO. MEXICO.

Office: Guanajuato, Mex. Mine office: Etzatlan, Jalisco, Mex. W. N. Cummings, manager. Property includes the Agua Blanca and Calabaza mines, carrying argentiferous and auriferous copper ores and argentiferous lead ores. The Calabaza mine has a 150′ shaft and 500′ tunnel, with steam power, and employs about 75 men.

FUROKURA MINE. JAPAN.

Mine office: Kazuno-gori, Rikuchu, Japan. Discovered 1762; opened 1765; idle 1794 to 1868. Has numerous veins, carrying chalcopyrite associated with iron pyrites, hematite and occasional sphalerite and galena, with a clay gouge, traversing tertiary strata and andesite. Production in 1900 was 615,489 lbs. refined copper.

FURUKAWA COPPER CO. JAPAN.

Office: Mitsu Bishi Bldg., Yayesco, Kojimachi, Tokio, Japan. Principal mine offices: Ashio, Shimotsuke; Innai, Akita; Rioshikaso, Echigo; Aniai, Ugo, Japan. Is much the largest copper producer of Japan and one of the leading mining companies of the world, employing about 25,000 persons and making nearly half the copper production of Japan. Junkicho Furukawa, president, succeeding the late Ichibei Furukawa, the founder of the company, who died in 1903; R. Kondo, general manager; M. Otagawa, assistant-manager; K. Asano, consulting engineer. Property includes 15 copper mines, 3 silver mines and 7 coal mines, the Ashio, Kusakura, Ani, Innai and Kune mines being the principal copper producers.

The Ashio mines, in the province of Shimotsuke, were discovered in 1610 and developed by the Tokugawa government, reaching a productive capacity of 2,000,000 to 3,000,000 lbs. of refined copper yearly in the latter half of the Seventeenth Century, and as this output was in excess of the home demand, the surplus was exported to Holland. The property came into the possession of the Furukawa company in 1877, in such poor condition that its yield was only about 400,000 lbs. of copper yearly, but by good handling and careful development, coupled with the introduction of the most approved methods and modern machinery, has been made the foremost copper mine of Japan. The country rocks are Paleozoic clay-slate, sandstone and hornstone, with intrusive liparite, numerous metal-

6% lead, 4.5% zinc, 35 oz. silver and about $4 gold per ton, from carbonate and oxide ores near surface and sulphides at depth. Has one shallow shaft and 2 tunnels, with about 2,000′ of underground openings, developing a considerable amount of ore. The installation of a power plant, concentrator and smelter is contemplated. Company has no debts and is developing conservatively, and is apparently a property of considerable promise.

COMPANIA MINERA LA GIBOSA Y ANEXAS. MEXICO.

Mines, at Jiminez, Chihuahua, Mexico, were sold to Guggenheim Exploration Co. in 1903.

GIBRALTAR COPPER MINING CO. WYOMING.

Office and mine: Encampment, Carbon Co., Wyo. Wm. L. Sill, president; Chas. E. Winter, secretary. Has a 4′ vein, giving assays of 20% copper.

GILA VALLEY COPPER CO. ARIZONA.

Property absorbed by Federal Mining Co.

GILBERT & NORRIS. MEXICO.

Mine office: Zacatecas, Zacatecas, Mex. Property opened by shaft and tunnels, with gasoline power. Employed about 40 men, at last accounts.

GILBREATH BROS. IDAHO.

Mining property sold to Copper King Mining Co., of Idaho.

GILCHRIST & DAWSON, INC. NEW MEXICO.

Mine office: Fierro, Grant Co., N. M. J. D. Gilchrist, general manager. Operates the Iron Head and Republic mines, producing copper and iron ores. Has steam power and employs 40 to 50 men.

GILES GOLD MINING & MILLING CO. COLORADO.

Mine office: Ward, Boulder Co., Colo. H. F. Llewellyn, superintendent. Ores carry gold, silver and copper. Has steam power and 10-stamp mill.

GIRILAMBONE COPPER MINING CO. AUSTRALIA.

Mine office: Girilambone, Cambelego Co., Nyngan Division, N. S. W., Australia. Opened 1880; present company organized October, 1896. W. Blakemore, mine manager. Employs about 200 men. Production in 1898, about 300 tons, a little silver being secured as a by-product. Ores are oxides, carbonates and sulphides, in a gangue of schistose and arenaceous slates, with numerous quartz veins and inclusions. Ore occurs as disseminations and replacements, without the defined limits of ordinary fissure veins, in slate and sandstone country rocks having occasional hard bands of quartzite. Alteration zone extends down about 200′. Deepest shaft, 520′. Ores are divided into three classes for treatment. First class comprises carbonates (including cuprite), with average assay value of 4.6%; oxides from the transition zone make the second class, and sulphides from the lower workings constitute the third grade, each class being smelted separately. Reduction is greatly hampered by ore's deficiency in sulphur and iron, and excess of silica. Water supply is very scant, causing trouble in times of drought. Mine has a dam and is compelled to filter and re-use the water repeatedly. Has a 250-ton smelter with 5 reverberatory furnaces workings show bornite and cuprite, with principal values from chalcopyrite associated with galena and iron pyrites, in the lower levels. The mine has steam and electric power and a small smelter, employing about 1,000 hands. Production was 578,544 lbs. refined copper in 1900, and was probably much larger in 1903.

The Ani, at Aniai, province of Ugo, is a group of very ancient mines, recently modernized in plant and mining practice. Shigeo Kasai is mine manager. The Ani mines have auriferous, argentiferous and plumbiferous sulphide ores of copper, the silver values secured as a by-product being considerable. The mine has steam, water and electric power, with a very good modern plant including a 10-stamp mill and a 150-ton smelter. About 2,500 hands are employed and the production is about 3,000,000 lbs. of refined copper yearly.

The Kune mine, at Sakuma-mura, Toyoda-gori, Totomi, was opened in 1726. The ore is chalcopyrite associated with iron pyrites, averaging 6% to 7% copper, occurring in three beds, the upper 100′ thick, the middie 12′ and the lowest 6′ in thickness, the latter splitting into two 2′ seams at the bottom. This property, which was recently taken over by the Furukawa company, made only 137,686 lbs. of refined copper in 1898, but is supposed to be producing quite extensively at present.

The Innai mine is at Innai, province of Akita. T. Minami is superintendent. This mine has auriferous and argentiferous copper ores and is equipped with steam, water and electric power, employing about 1,500 hands.

The operations of the Furukawa Copper Co. are not only a credit to the technical and administrative ability of the Japanese, but are so conducted that its mines would be considered well handled in any copper district of the world. Better and larger machinery is being added every year, and the executive and administrative staff of the company is given every opportunity to learn the latest and best in mining and metallurgical practice by frequent visits to Europe and North America. In fact there is none other of the great copper producers of the world that sends its responsible heads of departments so frequently to foreign countries to secure information that will enable them to keep step with the rapid progress now being made in all branches of the copper industry.

COMPANIA DE MINA GADITANA. SPAIN.

Office: Cadiz, Spain. Mine office: Aznalcollar, Seville, Spain. Was operating on a small scale at last accounts.

GAGNON MINE. MONTANA.

Owned and operated by Colorado Mining & Smelting Co.

GALENA MINE. MONTANA.

Mine office: Morris, Madison Co., Mont. D. A. Clapp, manager. Ores carry gold, silver and copper.

GALIZURSKI WORKS. RUSSIA.

Located in the government of Elizabethpol, Russia. S. Varavov, proprietor. Production for 1899 was 1,390,095 lbs. refined copper.

Manages and is principal owner of the Adelaide Star Mines, Ltd.
holds a bond on the Montreal group, in Beaver county, Utah.

GLEN-JENNINGS COPPER MINING CO. WYOM

Mine office: Encampment, Carbon Co., Wyo. M. J. J. Jennings, su
intendent. Was developing with small force, at last accounts.

GLOBE TRACT. MICHIG

Office: care of John Stanton, owner, 11 William St., New York. P
erty is a tract of 3,200 acres, comprising Sections 1, 2, 3, 4 and 5, in T
53 North, Range 35 West, Houghton county, Michigan. Property
rectangle, five miles in length, east and west, and one mile wide, lying
south of the Champion mine. Has been pratially explored by dian
drills, operation of which was greatly hampered by an exceptionally h
overburden of sand and boulders. The Baltic amygdaloid, which was
cupriferous bed sought, was found by 2 holes, and was copper-bearing
of normal size. It is the intention of Mr. Stanton to do the next explora
work by a working shaft and drifts therefrom, but no definite time has
set for beginning this work, which probably will not be started before
summer of 1904 or spring of 1905.

GLOBE COPPER MINING CO. WYOMI

Office: 24 Giddings Blk., Colorado Springs, Colo. Mine office: H
Laramie Co., Wyo. Organized 1901, under laws of Colorado, with cap
ization $1,500,000, shares $1 par. A. C. Widdicombe, president; J.
Morrison, vice-president and general manager; John H. House, secret
Stewart Davis, treasurer; Prof. H. C. Beeler, consulting engineer. La
22 claims, area 438 acres, in the Silver Crown district, showing sundry fis
veins, of which 3 of 7′ average width are opened by 5 shafts, of 100′ ave
depth, and by tunnels of 90′ and 160′, giving estimated average value
12% copper, 6 oz. to 10 oz. silver and $5 gold per ton from sulphide
Has steam power and an air compressor.

GLOBE MINING CO. ARIZO

Office and mine: Globe, Gila Co., Ariz. Eastern office: 506-171 W
ington St., Chicago, Ill. Employs 5 to 10 men. J. F. Hechtman, presi
and general manager; Walter M. DeKalb, vice-president; Geo. Beach, se
tary; Chas. J. Maybush, mine superintendent. Organized Feb. 19, 1
under laws of Arizona, with capitalization $2,500,000, shares $1 par. La
27 claims, area 540 acres, including 20 copper claims and 7 gold clai
in the Globe district. Country rocks are granite-porphyry, quartzite, dio
and syenite, showing sundry fissure veins in diorite, ranging 2′ to 100
width, with iron cappings, and giving assays of 2% to 6% copper, 4 oz
30 oz. silver and $2 to $28 gold per ton, from oxide and sulphide ores ope
by shafts of 40′ and 90′ and a 60′ tunnel. Company plans installing a st
plant.

GLOBE-BOSTON COPPER MINING CO. ARIZO

Offices: Leavenworth, Kansas and 253 Broadway, New York. M
office: Globe, Gila Co., Ariz. Organized under laws of Arizona, with capi
ization $2,000,000, shares $1 par. E. W. Crancer, president; W. F. K

nedy, secretary; Geo. S. Andrus, superintendent. Lands, 21 claims, in the neighborhood of the Old Dominion and United Globe mines. Development, begun in 1901, is by a 465′ two-compartment shaft, with considerable drifting, showing a 4′ vein carrying low-grade chalcopyrite with occasional bunches of 60% bornite, all with fair silver values. Has steam power and a good mining equipment.

GEWERKSCHAFT GLUCKSBRUNN. GERMANY.

Mine office: Glücksbrunn, Sachsen-Meiningen, Germany.

GOAT CREEK MINING CO. WASHINGTON.

Mine office: Methow, Okanogan Co., Wash. John R. Cassin, manager. Ores carry gold, silver and copper. Employs 10 men.

GODIVA MINING CO. UTAH.

Mine office: Eureka, Juab Co., Utah. J. H. McChrystal, superintendent. Ores carry gold, silver and copper. Has steam power and employs about 75 men.

A. GOERZ & CO., LTD. GERMAN SOUTHWEST AFRICA.

Offices: 20, Bishopsgate St. Within, London, E. C., Eng.; 26, Rue Lafitte, Paris, France; 8, Behrenstrasse, Berlin, W., Germany, and 4, Fraser St., Johannesburg, Transvaal, South Africa. Lord Battersea, chairman; Amandus Brakhan, Johannesburg, and Henry Stakosch, London, managing directors; H. G. Vines, secretary, London. Has extensive holdings in the Witwatersrandt gold fields, also exclusive prospecting rights over 6,500 square miles in German Southwest Africa. Construction of a railroad line from the sea to Swakopmund is planned. Copper ores have been discovered at a number of points in the district controlled by this company.

GOLD ANCHOR MINING CO. COLORADO.

Mine office: Alice, Colo. Thos. I. Slater, manager. Ores carry gold, silver and copper. Has gasoline power.

GOLD BELT MINING CO. MONTANA.

Mine office: Empire, Lewis & Clarke Co., Mont. Owen Byrnes, superintendent. Operates the Empire and other mines producing gold, silver, lead and copper. Has steam power, 60-stamp mill and 500-ton cyanide plant, employing about 50 men.

GOLD BUG MINE. COLORADO.

Mine office: Empire, Clear Creek Co., Colo. N. B. Clough, superintendent. Ores carry gold, silver and copper. Employed a small force at last accounts.

GOLD BUG CONSOLIDATED MINING CO. WASHINGTON.

Mine office: Bossburg, Stevens Co., Wash. F. H. Merritt, superintendent. Ores carry gold, silver and copper.

GOLD & COPPER CO. OF BINGHAM. UTAH.

Office: 600 McCornick Bldg., Salt Lake City, Utah. Mine office: Bingham Canyon, Salt Lake Co., Utah.

GOLD & COPPER CONSOLIDATED MINING & MILLING CO. ARIZONA.

Office: 402-130 Dearborn St., Chicago, Ill. Mine office: Groom Creek,

Yavapai Co., Ariz. Organized 1901, under laws of Arizona, with capit
ization $4,000,000, shares $1 par. R. A. Sweet, president and treasur
J. B. Pogue, secretary; A. J. Pickrell, general manager; J. Chidister, sup
intendent. Lands, 35 claims, area 700 acres, including the Rockefell
Chicago, President and Little Kid claims, in the Hassayampa and Big B
districts, showing numerous fissure veins carrying auriferous and argen
ferous oxides, carbonate and sulphide ores of copper, with estimated avera
values of 7% copper, 46 oz. silver and $38 gold per ton, with undetermin
lead values. Has 34 pits and shafts of 10′ to 500′ depth, and 21 tunn
of 20′ to 800′ length, with about 2 miles of underground openings, and co
pany estimates 150,000 tons ore blocked out for stoping. Has a go
steam power equipment, with hoists, shops, etc., also a 10-stamp mill,
ton cyanide plant and 50-ton concentrator, employing about 50 men. P
perty has been under development for past 9 years and stamp mill and cy
nide plant are running night and day. Company was still advertising sto
for sale at the close of 1903. Officials of company are men of good stan
ing, but if this property has anything like the development and ore valu
claimed, the selling of stock with the mill in operation is inexcusable.

GOLD & COPPER DEEP TUNNEL MINING & MILLING CO. NEW MEXIC

Mine office: Elizabethtown, Colfax Co., N. M. L. J. Burt, preside
Jas. Lynch, secretary; W. P. McIntyre, manager. Lands, 105 acres,
the Moreno district, opened by 2 shafts and a tunnel, showing aurifer
copper ores.

GOLD & COPPER FIELDS SYNDICATE, LTD. AUSTRALI

In voluntary liquidation. G. Addison-Scott, liquidator, 5-6, Gre
Winchester St., London, E. C., Eng. Property, about 850 acres, in t
parish of Byng, County Bathurst, N. S. W., Australia.

GOLD & COPPER MINING CO. NEW MEXIC

Mine office: Rociada, Mora Co., N. M. Jos. L. Mott, superintende
Has auriferous and argentiferous copper ores and a 10-ton smelter.

GOLD-COPPER MINING & DEVELOPMENT CO. SOUTH DAKOT

Letter returned unclaimed from Deadwood, Lawrence Co., S. D. O
ganized February, 1903, to develop lands just outside of the corporate limi
of Deadwood.

GOLD HILL COPPER CO. NORTH CAROLIN

Mine office: Gold Hill, Rowan Co., N. C. Walter G. Newcomer, pre
ident. B. B. Miller, Salisbury, N. C., appointed receiver, on petition
creditors, August, 1903. Property is the old Gold Hill mine, with a 2
stamp mill, operated intermittently since circa 1850.

GOLD HILL QUARTZ MINING CO. OREGO

Office: 111 Fifth Ave., New York. Mine office: Gold Hill, Jacks
Co., Ore. C. R. Ray, superintendent. Property includes the Braden, Co
ger and Elk Creek mines, ores of which carry gold, silver, lead and copp
Has steam power and 10-stamp mill, employing about 40 men.

GOLD KING CLAIMS. COLORAD

A prospect about one mile east of the Mt. Zirkel mine, at Pearl, La
mer Co., Colo.

GOLD KING CONSOLIDATED MINES CO. **COLORADO.**

Office: Waterville, Me. Mine office: Silverton, San Juan Co., Colo. W. Z. Kinney, superintendent. Ores carry gold, silver and copper. Has steam, electric and gasoline power and an 80-stamp mill. Employs about 100 men and secures a little copper as a by-product.

GOLDEN GATE GROUP. **COLORADO.**

Mine office: Conrad, Park Co., Colo. A prospect, near the foot of Badger Mountain, Tarryall district, said to show a vein of 10′ to 30′, giving assays of 12% to 62% copper, and $10 and upwards gold, per ton.

GOLDEN KEY MINE. **WASHINGTON.**

Letter returned unclaimed from former mine office, North Bend, King Co., Washington.

GOLDEN MINT MINES, LTD. **NORWAY.**

Offices: Throgmorton House, 15, Copthall Ave., London, E. C., Eng. Mine office: Eidsvold, Hedemarken, Norway. E. Page, chairman; A. Löberg, mine manager. Property, 220 acres, gold and copper claims, with 15-stamp mill and concentrator, Company also owns the Lyngenfjord copper mine, at Kaafjord, Finmarken, Norway, which is operated on a small scale. Ore from the Lyngenfjord mine is transported to Kaafjord by aerial tram, for shipment by sea to smelters.

GOLDEN RULE COPPER MINING & SMELTING CO. **ARIZONA.**

A fraudulent mining company, formerly having an office at 220 Broadway, New York, and supposed to have had 17 claims near Oracle, Pinal county and Vail, Pima county, Arizona. Was promoted by one Wm. E. Lake, "a prominent church and Sunday school worker" of Yonkers, N. Y., who purchased sundry holes in the ground in Arizona at a cost of $500, then organized a million-dollar company thereon, keeping for himself all but the 7 shares required for dummy directors. He then pledged the company to pay him $15,000, and generously donated 200,000 shares to the treasury. Purchasers thought they were obtaining treasury stock and Christian friends invested $125,000, of which only $15,000 has ever been accounted for. Assets of the company, at the time of the show-down, were a donkey hoist in Arizona and a roll-top desk in New York, the company having lost the hole in the ground on which it was originally incorporated.

Moral: Any man—no matter who or where—selling mining stock on the strength of his church standing or alleged piety may be safely set down as a swindler.

GOLDEN STATES MINES, LTD. **ARIZONA.**

Offices: 20-21, Lawrence Lane, London, E. C., Eng. C. F. Branton, chairman; G. Thompson, secretary. Capital, nominal, £100,000, shares 5s. par; issued, £61,254. Lands, 120 acres, near Copper Creek, in the Dragoon Mountains, Cochise Co., Ariz. Property supposed to have small smelter. Idle at last accounts.

GOLDSMITH COPPER CO., LTD. **BRITISH COLUMBIA.**

Letter returned unclaimed from former mine office, Howe Sound, Burrard district, Vancouver Island, B. C.

GOLETA CONSOLIDATED MINES. **CALIFO**
Mine office: Jordan, Mono Co., Cal. Hugh W. Nelson, superinte
Primarily a gold mine, but is developing a 6′ vein of chrysocolla.
40-stamp mill and cyanide plant with water power and employs ab
men.

GOLINSKY GROUP. **CALIFO**
Office and mine: care of B. Golinsky, owner, Kennett, Shasta Co
A group of 12 claims having about 750′ of underground openings sh
a main ore chute of about 30′ width, said to give fair assay values.

MINA DE RUY GOMES. **PORT**
Owned and operated by Companhia Mineira Alemtejana.

SUCESION P. GONZALES. **C**
Office and mine: Labrar, Freirina, Atacama, Chile. Product, s
as matte, is equivalent to 500 to 700 tons of refined copper yearly.

GOOD HOPE MINING & REDUCTION CO. **COLO**
Office: Del Norte, Colo. Mine office: Vulcan, Saguache Co., Co
H. Weiss, superintendent. Ores carry gold, silver and copper. Has
power and employs about 35 men.

GOODLANDER MINING & MILLING CO. **ME**
Office: 603 New Ridge Bldg., Kansas City, Mo. Mine office:
zuma, Sonora, Mex. Ores carry gold, silver and copper. Mine ope
shaft. Has steam power and 10-stamp mill. Employs about 40 me

GOODRICH MINE. **AUSTR**
Mine office: Yeoval, New South Wales, Australia. An old pro
once a considerable producer of gold and copper, reopened in 1902,
new 450′ shaft sunk to get beneath the former workings, which hav
reached by a crosscut. Ore assays 18% copper and 4 oz. gold per to
occurs in a pipe-vein about 300′ in diameter. Mine has given much t
in the past from caving, and requires very careful handling.

GOODVENTURE MINING & MIILLNG CO. **WYO**
Mine office: Hecla, Laramie Co., Wyo. Theo. Grout, superinte
at last accounts.

GOULAIS BAY MINING CO. **ONT**
Supposed to have capitalization of $3,000,000, with shareholders
residents of Michigan. Lands, about 1,300 acres, on Goulais Bay, 26
north of Sault Ste. Marie, Algoma, Ont., on which a little exploratory
has been done.

GOULD MINING CO. **WYO**
Mine office: Centennial, Albany Co., Wyo. Lands, sundry clai
summit of Centennial Mountain, said to show ore assaying 30%
and $50 and upwards gold per ton.

GRAFTER MINE. **YU**
Mine office: Whitehorse, Yukon Ter., Canada. Said to have mad
shipment of ore, to smelter at Crofton, B. C., early in 1903.

GRAHAM COUNTY MINING CO. **ARI**
Office: 1509-20 Broad St., New York. Mine office: Fort Grant, G

Co., Ariz. Capitalization $250,000, shares $10 par. John W. Manning, president; Schuyler S. Moore, secretary and treasurer; Prof. Geo. A. Treadwell, consulting engineer. Lands, sundry gold-copper claims in the Clark district, on which the company claims to have expended upwards of $100,000 in development work.

LA GRAN FUNDICION CENTRAL MEXICANA. **MEXICO.**

Office and works: Aguascalientes, Aguascalientes, Mexico. Owned and operated by the American Smelting & Refining Co., 71 Broadway, New York.

LA GRAN PROVEEDORA DE COBRE. **MEXICO.**

The Mexican corporation of the Arizona-Mexican Copper Co.

GRANBY CONSOLIDATED MINING, SMELTING & POWER CO. **BRITISH COLUMBIA.**

Office: 62 Canada Life Bldg., Montreal, Canada. Mine office: Phoenix, B.C. Works office: Grand Forks, B. C. Employs about 550 men, of whom 350 are at the mine and 200 at the smelter. S. H. C. Miner, president; Jay P. Graves, vice-president and general manager; A. C. Flumerfelt, assistant to the president; preceding officers, J. H. McKechnie, W. H. Robinson, Fayette Brown, W. H. Nichols, John Stanton, Jacob Langeloth, Geo. Martin Luther, Clement S. Houghton and A. L. White, directors; R. R. Macaulay, secretary; Geo. W. Wooster, treasurer; H. N. Galer, assistant general manager; A. B. W. Hodges, smelter superintendent; Wm. Yolen Williams, mining superintendent. Organized March, 1901, under laws of British Columbia, with capitalization $15,000,000, shares $10 par and non-assessable; issued, 1,336,303 shares, which were listed on the Boston stock exchange April 22, 1903. First dividend, of 1%, amounting to $133,630.30, was paid Dec. 16, 1903. Boston Safe Deposit & Trust Co., registrar; American Loan & Trust Co., of Boston, transfer agent. Fiscal year ends June 30; annual meeting, second Tuesday in October. Lands, 10 claims, area 338 acres, crown-granted, including the Old Ironsides, Knob Hill, Victoria, Grey Eagle, Banner, Tip Top and Triangle claims. Property is a consolidation of the Knob Hill, Old Ironsides and Grey Eagle mines with the Granby smelter. Miscellaneous landed holdings include 61 acres of limestone lands for flux, a 540-acre millsite, 59 city lots at Grand Forks, 280 city lots at Phoenix and 500 acres at Carson, B. C. Ore body is an immense vein of about 400′ average width, striking approximately north and south and with a dip of about 50° to the east at the surface, pitching more sharply at depth. Ore is chalcopyrite, disseminated very evenly throughout the entire vein, averaging about 2% copper with small gold and silver values, and only 5% to 6% sulphur. This body extends 4,000′ on the company's lands and has been proven continous, with practically unaltered values, to a depth of 800′ by diamond drill borings, but has been opened to a depth of about 300′ only. Mining has been carried on by shafts and tunnels, with occasional open cuts, but the present policy of development is to work everything open-cast, milling the ore through winzes to the main tunnel for removal from the mine. The present production is about half from open-pits and half from the two shafts operated, but this will be changed to open-cut extraction as rapidly as possible. The open-cuts are worked in 100′ benches, from which 50′ slices are taken by 3 steam shovels, largest having a capacity of about 1,500 tons daily. Ore is shattered by blasting and then removed by shovel. The largest opening is about 400x1,000′ in size and a new open-pit on the Grey Eagle property is to be connected by shaft with the main tunnel, the plans of the company practically calling for the mining off of the mountain. Ore reserves are estimated by the company at 20,000,000 tons, but are actually much larger. Application has been made to the provincial legislative assembly for permission to drive a four-mile double track railway tunnel into the mountain from Boundary Creek, to tap the ore bodies, now opened on surface, at a depth of about 4,000′. Should this tunnel, as it probably will do, show a continuation of the immense vein at that depth, the Granby's ore body will then be proven much larger than the combined ore reserves of the Rio Tinto, which now possesses the largest known ore deposits of the world.

No. 2 shaft has a 3-ton 12x16″ double cylinder hoist. A 5-compartment shaft is being sunk on the Victoria claim, which occupies a central position in the group. At the portal of the upper tunnel is a 22x55′ crusher building with a 2,000-ton ore-bin, receiving ore from the mine, which, preliminary to shipment to the smelter, is put through a Farrel-Bacon style B ore crusher with steel jaws 30x42″ in size, of 150 tons hourly capacity, driven by a 100-h. p. electric motor. This crusher is capable of breaking masses of nearly one cubic yard in size to chunks not larger than 7″ to 8″. The company plans to install two small locomotives, hauling 5 to 7 cars each, in tunnels No. 1 and No. 2, to replace horses.

Power is taken from an electric plant at the Kettle River, 30 miles distant, 1,500 h. p. being used at the mines. The falls can generate about 6,000 h. p. The compressor building, 60x121′ in size, houses a 60-drill Rand tandem compound air compressor with 16x30″ high-pressure cylinders and 28x36″ low-pressure cylinders, capable of compressing 6,000 cubic feet of free air per minute to a pressure of 70 lbs. The compressor is electrically driven by rope transmission from two 700-h. p. type C Westinghouse induction motors. The combination machine shop and smithy is 48x118′ in size. The company also owns 20 cottages and two hotels and boarding houses at Phoenix, the Granby hotel being a $25,000 three-story structure with electre light and steam heat.

The smelter, at Grand Forks, is connected therewith by the Canadian Pacific railway, there being a 2,000′ drop in the 24 miles distance between the smelter and mine. The smelting plant is much the largest and best in Canada, having a daily capacity of 2,100 tons, with 6 furnaces, 44x160″ at the tuyeres, of which 2 were blown in November, 1903, the plant treating an average of upwards of 2,000 tons daily at the close of 1903. The ore is practically self-fluxing and is charged as mined, without attempt at milling or concentration. The product of the first fusion is a 60% matte, which is blown up by converters to 99% blister copper. Power is furnished by an 1,100-h. p. electric plant, and there are 7 blowers, one for each furnace with one in reserve for emergencies. There is also a 20-ton reverberatory tilting furnace. Furnaces are charged automatically, by an ingenious device designed by superintendent Hodges. Slag is granulated and removed by two 8x14" locomotives traversing a 36" slag track running to the dumps. The converter building is 68x160' in size and is 100' from the furnace building, with which it is connected by a 40-ton traveling crane carrying matte. The converter shells are 72x100" in size, of the horizontal barrel type. The converter building has a silica mill equipped with crusher and grinding-pan, and has three mould-carriers under each converter stand. Product is turned out as a 99% blister copper, carrying gold and silver values, and is shipped to the Nichols Chemical Co. at Laurel Hill, New York, for refining. Much trouble has been experienced in the past in securing adequate coke supplies, and to obviate future difficulties from this source, the International Coal & Coke Co. was organized, in 1903, with capitalization of $3,000,000, by practically the same shareholders as those of the Granby, although the corporations are distinct. The International company has extensive high-grade deposits of coking coal at Blairmore, Alberta, Northwest Territory. It is evident that the mine is growing too rapidly for the smelter, and further new smelting installations are under consideration, and the construction of a new smelter at the mouth of the proposed 4-mile tunnel has been considered tentatively. The smelting plant will probably reach a capacity of at least 5,000 tons daily, within the next few years.

At the close of 1903 the Granby was producing at the rate of about 1,500,000 lbs. of refined copper monthly. For the fiscal year ending June 30, 1903, the production was 12,551,578 lbs. of refined copper, 277,574 oz. of silver and 35,121 oz. of gold, made from 289,583 tons of ore smelted, in addition to which 7,690 tons of foreign ore and 6,130 tons of foreign matte were treated. Construction expenses for the fiscal year were $207,481, these being charged direct to operating expenses—the only correct policy for a growing mine. Total mining costs for the year were $1.20 per ton and smelting costs were $1.35 per ton, but these costs were still lower at the close of the year, reflecting great credit on the economy and ability of the management. The profit of 67c. per ton of raw ore made during the fiscal year should be increased as additional smelting capacity is secured. With the aid of the considerable gold and silver values carried the Granby should eventually make copper at a cost of 7c. per lb., or even less, given a continuance of the present able management. The payment of a 1% dividend in December, 1903, left a surplus of about $250,000 on hand, and it is probable that 1% dividends will be paid quarterly hereafter.

The company's estimate of ore reserves of 20,000,000 tons is much too small, but the management cannot be blamed for refusing to make public the true figures, which are so overwhelmingly large that they would probably be discredited by those not conversant with the phenomenal size of the Granby's ore body. As a matter of fact the ore reserves of the Granby cannot be fairly estimated at less than 50,000,000 tons, even with the present development, and are probably much larger. While this mine is of very low grade, the remarkable extent of its ore bodies, coupled with the prudence and vigor of its management, render it a property of altogether exceptional merit, and one that is certain soon to rank among the world's large producers, as the productive capacity of the mine practically is limited only by the size of its smelting plant. The management is thoroughly good and the Granby is easily the foremost copper mine of Canada, with every prospect of retaining that place for many years to come.

GRAND CANYON COPPER CO. ARIZONA.

Mine office: Grand View, Coconino Co., Ariz. Mine is located near the bottom of the Grand Canyon, 3,000′ below the rim. Was operating in a small way at last accounts.

GRAND CENTRAL MINING CO. UTAH.

Mine office: Tintic, Juab Co., Utah. Patrick Donnelly, superintendent. Is primarily an auriferous silver-lead mine, but carries considerable values in copper. Is extensively developed and a considerable producer, employing about 100 men.

GRAND DEPOSIT COPPER CO. NEVADA.

Office: Cherry Creek, White Pine Co., Nev. Organized 1903. John Stanton, president; J. S. Page, secretary; Pierre de P. Ricketts, treasurer. Company has recently purchased the Grand Deposit group, which is said to show considerable ore bodies giving assays of 7% to 12% copper, and is now developing same with a force of about 25 men.

GRAND GULCH MINING CO. ARIZONA.

Mine office: St. George, Utah. James E. Jennings, superintendent. Capitalization $700,000, shares $2.50 par. Lands are in Arizona, just across the line from St. George, Utah. Mine is 370′ deep, main shaft to be sunk to 500′. Owing to inaccessibility, only very high-grade ores are shipped, these averaging about 50% copper, with small gold and silver values.

GRAND MARAIS COPPER MINING CO. MINNESOTA.

Had lands in Cook county, Minnesota. Letter returned unclaimed from former office in Chicago. Company probably dead.

GRAND MT. LYELL COPPER CO., LTD. TASMANIA.

Mine office: Mt. Lyell, Montague Co., Tasmania. At last accounts was doing prospecting work, in Sections 682, 789 and 1674, with force of 11 men.

GRAND PRIZE COPPER MINING CO. ARIZONA.

Property near Payson, Gila Co., Ariz. Attached for debts, 1902, by Bank of Arizona.

GRAND RAPIDS COPPER CO. WYOMING.

Property sold to Saginaw Valley Copper Mining Co.

GRAND REEF COPPER MINING CO. ARIZONA.

Mine office: Aravaipa, Graham Co., Ariz. James Quinn, superintendent. Property is owned by the John W. Mackay estate. Large sums were expended in development, machinery installations and general improvements, the plant including a 3-stamp mill and 90-ton smelter. Supposed to be idle.

GRAND REPUBLIC COPPER MINING CO. **COLORADO.**

Office: 52-240 La Salle St., Chicago, Ill. Mine office: Pearl, Larimer Co., Colo. Employs 8 to 10 men. Organized 1902, under laws of Wyoming, with capitalization $1,500,000, shares $1 par. W. A. McGuire, president; E. V. Boisot, secretary and treasurer; L. D. Godshall, general manager; Saml. Fields, superintendent. Lands, 7 claims, area 70 acres, 7 miles south of Pearl, in the Big Horn district, showing a 3′ paystreak carrying considerable native copper, in a schistose vein cut at depth of 130′ by a 200′ shaft. Also has a sulphide ore body.

GRAND TRAVERSE & ARIZONA MINING CO. **ARIZONA.**

Office: Traverse City, Mich. Mine office: Cave Creek, Maricopa, Ariz. Employs 7 men. Thos. Smurthwaite, president; F. E. Withey, vice-president and general manager. Organized May 6, 1903, under laws of Arizona, with capitalization $1,000,000, shares $1 par. Lands, 22 claims, area 440 acres, in the Cave Creek district, showing 9 veins, of which 3 are being developed, these having average widths of 8′, 14′ and 18′ and giving assays of 10% to 30% copper, 8 oz. to 12 oz. silver and $8 to $120 gold per ton, from oxide, carbonate and sulphide ores. Is opened by 5 pits and shafts, 2 deepest 40′ each, and tunnels of 30′ and 51′. Nearest railroad, 38 miles. Company plans developing vigorously during 1904.

GRANDVIEW MINING & MILLING CO. **UTAH.**

Has lands in Utah, near the Colorado line, from which ore has been secured giving good assay values in gold, silver and copper.

MINAS GRANDE Y COBRE GRANDE. **MEXICO.**

Said to be located near Fronteras, Sonora, Mexico, but letters to that address returned unclaimed.

GRANITE CREEK SMELTING & REDUCTION CO. **NEVADA.**

Mine office: Golconda, Humboldt Co., Nev. Martin Lindley, manager. Ores carry copper and gold. Has steam power and employs a small force.

GRANT COPPER MINING CO. **COLORADO.**

Office: Encampment, Wyo. Organized 1901, under laws of Wyoming, with capitalization $1,000,000. Leo Davis, president; C. W. Taylor, vice-president; H. D. Ashley, secretary; Theo. Davis treasurer. Lands are 3 claims, one half-mile from Pearl, Larimer county, Colorado. Vein said to be 12′ wide, and to give average assay values of 10% copper.

GRASLITZER KUPFERBERGBAU. **AUSTRIA.**

Mine office: Eilenberg, Bohemia, Austria. Mines are very ancient, and were one of the principal sources of European copper supply during the middle ages. Were abandoned, circa 1700, and reopened 1901. Vein is 12′ to 15′ wide, in clay-slate. A new smelter has been built and the mine reopened on a large scale. Employs 1,000 men.

GRAY EAGLE & HARD TIMES MINES. **COLORADO.**

Said to be located near Silver Cliff, Custer Co., Colo., but letter to that address returned unclaimed.

O. B. GRAY COPPER CO. NEW JERSEY.

Mine office: Pennington, Mercer Co., N. J. Organized May, 1901, with capitalization $250,000. Vein claimed to be 30′ wide and one-half mile long. Property thought to be idle.

GRAYTON COPPER MINES CO. COLORADO.

Organized 1902, to develop Grayton group, 3 miles north of Pearl, Larimer Co., Colo. Letter to that address returned unclaimed.

GREAT BELCHER GOLD & COPPER CO. ARIZONA.

Office: 89 State St., Boston, Mass. Letter returned unclaimed from former office, Real Estate Trust Bldg., Philadelphia, Pa. Mine office: Providence, Yavapai Co., Ariz. Chas. B. Cramp, president; D. F. Murphy, secretary. Was floated by Henry B. Clifford, and at last accounts shareholders were being invited to exchange stock for holdings in the Great Belcher-Bullwhacker-Merger Co., which, judged solely by the noble euphony of its name, must be a highly meritorious enterprise.

GREAT BELCHER-BULLWHACKER-MERGER CO. ARIZONA.

Office: 517-10 Wall St., New York. Mine office: 26 Lawler Bldg., Prescott, Yavapai Co., Ariz. Supposed to be a consolidation or an attempt at a consolidation in 1902-1903 of the Great Belcher Gold Mining Co., Bullwhacker Mining Co., Empress Mining Co., Sunlight Mining Co., and Queen of Arizona Copper Co. An improvement upon this title that would have retained the identity of all the constituent companies, and which would also have appealed to the aesthetic sensibilities of the fastidious, would have been to call the new corporation The Queen of Arizona Great Belcher by Sunlight and Empress Bullwhacker Mining & Merging Co.

GREAT CENTRAL FREEHOLD MINES, LTD. AUSTRALIA.

Offices: Finsbury House, Blomfield St., London, E. C., England, and 47, Queen St., Melbourne, Australia. Mine office: Mt. Hope, Blaxland Co., N. S. W., Australia. D. E. McBryde, chairman; E. Habben, secretary, London; J. Brandon, manager, Melbourne; J. Martin, superintendent, Mt. Hope. Capital, nominal, £500,000; issued, £390,000, shares £1 par. Said to have paid dividends of £202,000, to close of 1899. Lands, 939 acres, at South Mt. Hope, showing large bodies of low-grade ore. Present production, 400 to 500 tons refined copper yearly. Ores, oxides and carbonates to a depth of about 250′, sulphides below. Oxidized ores have a decomposed porphyry gangue; sulphide ores occur in brecciated porphyry. Has steam power and smelter. Water supply is occasionally inadequate. Company also owns the Mt. Allan mine, 11 miles distant. Employs about 100 men.

GREAT COBAR COPPER MINING SYNDICATE. AUSTRALIA.

Offices: Equitable Bldg., Sydney, Australia. Mine office: Cobar, Robinson Co., N. S. W., Australia. Works office: Lithgow, N. S. W., Australia. Dr. Richard Reed, mining director; W. Longworth, general manager; G. H. Blakemore, mine manager. This is the most important copper producer of New South Wales, having been first opened in 1869 and closed 1892, after making 26,611 long tons of fine copper from rich oxidized ores averaging 11.07% in tenor, after failure to reduce sulphides in a reverberatory furnace. Was reopened 1892, by tributors, on a 10-year lease, and at close of 1902 had produced under their management 730,669 tons of ore giving average returns of 3.27% copper. A long-standing dispute between the tributors and the fee-owners was settled in 1903 through the purchase of the property by the tributors, who form the present company.

Lands, 1100 acres, freehold, including the townsite of Cobar, also the Nymagee copper mine at Nymagee, the Great Peak gold mine at Cobar, sundry coal mines at Lithgow and Rix Creek yielding good coking coal, and the Lithgow Copper Smelting & Refining Works, at Lithgow. The Great Cobar mine works three veins of nearly vertical dip, known as the East, Middle and West lodes, principal openings being on the latter. Country rock is slate, and the ore, which is auiferous and bismuthiferous, occurs in chutes, 50′ to 70′ in width by 200′ to 300′ in length and of indefinite depth. Ore is won by overhand stoping, with 10′ pillars left beside the shafts, and timbering is by bulkheads filled with waste, this being known locally as the "pigstye" system. The ore is first broken in immense masses, then reduced to smaller size by block-holes and pop shots. The property is said to have upwards of a million tons of ore blocked out averaging better than 3% copper with values of about $2 per ton in gold and silver. The West lode is 70′ wide at points on the 90-fathom level, and the mine works about 20 stopes. The "New" shaft is 892′ deep. Operations are occasionally hampered by scarcity of water, the country being arid.

The Peak or Great Peak gold mine has a stamp mill, and as the ore is silicious and free from iron and sulphur, it would seem a highly suitable flux for the basic ores of the Cobar and Nymagee copper mines.

The Nymagee mine, at Nymagee, Priory Plains, Mouramba county, N. S. W., was opened in 1880 and is about 50 miles from the Great Cobar, but lacks railway facilities. Country rocks are slates and sandstone, the main ore body being 15′ to 20′ in width and carrying 10% copper in a chute about 250′ long and of indefinite depth. Has 3 shafts, deepest 734′, and ores outside of the rich chute average about 2% copper only, hence are unworkable. The Nymagee has a pyritic smelter with good water-jacket blast furnaces and a reverberatory furnace for blowing up matte to blister copper averaging 99.75% in tenor.

The Lithgow smelter has five 100-ton water-jacket blast furnaces and turns out blister copper carrying about $40 per ton in gold and silver, which is refined by an electrolytic plant installed in 1902.

This property is a very valuable one and probably capable of much larger production than has yet been secured. Its management has been excellent and both the mining and smelting practice of the Great Cobar rank deservedly high.

GREAT CONDURROW TIN & COPPER MINING CO., LTD. ENGLAND.

Offices: Broad Street House, London, E. C., Eng. Mine office: Camborne, Cornwall, Eng. Major J. Meade, chairman; H. Batt, secretary; Nicholas J. West & Sons, consulting engineers. Registered, Feb. 18, 1902. Capital, nominal, £50,000, shares £1 par. Lands, 100 acres leasehold and mining rights to 200 acres adjoining. Leased lands held on royalty of one 24th when dividends are being paid; one 48th when expenses are being paid, and no royalty when company is not paying its way.

GREAT DIVIDE GOLD CO. **CALIFORNIA.**

Letter returned unclaimed from former mine office, Redding, Shasta Co., California.

GREAT DIVIDE MINES CO. **UTAH.**

Mine office: McCornick Bldg., Salt Lake City, Utah. Organized 1903, with capitalization $2,000,000, shares $5 par. Henry A. McCornick, president; Joseph H. Hurd, secretary. Lands, 325 acres, near the Utah Consolidated, in Bingham Canyon, Salt Lake Co., Utah. Is driving a tunnel, about 600′ in length at close of 1903.

GREAT FREEHOLD MINE. **AUSTRALIA.**

Absorbed by Queensland Copper Co., Ltd.

GREAT LAKES COPPER CO. **ONTARIO.**

Office: care of Exploration Co., 15 Broad St., New York, N. Y. Organized 1900, under laws of West Virginia, with capitalization $3,000,000, shares $5 par. John McKinley president; Horace Williston, secretary; Robert Sloane Bickford, treasurer. Lands, upwards of 4,000 acres, near Sudbury, Algoma, Ontario, carrying nickeliferous chalcopyrite associated with iron pyrites. Has several shafts, deepest 150′, also an open-cut, with a considerable amount of ore in sight. The Graf smelting process was tried but proved a failure. Property mortgaged; affairs of corporation are in chaotic shape and no information is furnished shareholders.

GREAT LAKES MINING & MILLING CO. **WYOMING.**

Supposed to have claims in the vicinity of Encampment, Carbon Co., Wyo., but letter to that address returned unclaimed.

GREAT LAKES MINING & SMELTING CO. **WYOMING.**

Office: Manitowoc, Wis. Mine office: Encampment, Carbon Co., Wyo. Isaac Craite, president; R. W. Burke, vice-president; J. V. Miller, secretary; C. H. Seeger, treasurer; F. C. Miller, manager.

GREAT LAXEY, LTD. **ISLE OF MAN.**

Offices: 1-2, George St., London, E. C., Eng. Mine office: Laxey, Isle of Man, Great Britain. Registered, March 3, 1903, by Greenip, Snell & Co., with capitalization £30,000, shares 10s. par, with 45,000 preferred and 15,000 deferred shares, to take over the business and property of the Great Laxey Mining Co., Ltd., in liquidation. Mine produces lead, silver, copper and zinc. Property is noted for possession of largest water wheel in the world. Unwatering in progress, with a new power and pumping plant, at close of 1903.

GREAT MAMMOTH COPPER MINING CO. **WASHINGTON.**

Had an office at 45 Milk St., Boston, Mass., and 10 claims adjoining the Index-Independent mines, at Index, Snohomish Co., Wash. Promoters sold their own stock and pocketed proceeds. Company lost its lands, and stock presumably worthless.

GREAT MOUNT LYELL COPPER CO., LTD. **TASMANIA.**

Reorganized, 1903, as Ballarat & Lyell Mines, Ltd.

GREAT NORTHERN MINING CO. **WASHINGTON.**

Letter returned unclaimed from former mine office, Baring, King Co., Washington.

GREAT REPUBLIC COPPER & GOLD MINING CO. **ARIZONA.**

Office: 31 Bank of Arizona Bldg., Prescott, Ariz. Mine office: Turkey, Yavapai Co., Ariz. Employs 10 men. John M. Sullivan, president and general manager; F. E. Jordan, secretary and treasurer; Geo. W. Oakman, assistant secretary. Organized May 1, 1901, under laws of Arizona, with capitalization $3,000,000, shares $1 par. Lands, 33 claims, in three groups, area upwards of 600 acres, in the Black Canyon district, on lower Turkey Creek. Has shafts of 50′, 70′ and 192′, and a 315′ tunnel, showing 3 veins, stated by company to average 50′ in width, carrying an average of 7% copper and 1.5% silver per ton, in oxide, carbonate and sulphide ores. Has a 15-h. p. gasoline hoist and is only 2½ miles from Prescott & Eastern railroad. Management plans sinking and crosscutting to determine the size of its ore bodies. Character of management is good and property considered promising.

GREAT STANDARD COPPER MINING CO. **WYOMING.**

Office: care of Colonial Security Co., 161 Summer St., Boston, Mass. Mine office: Granite Canyon, Laramie Co., Wyo. Organized Sept. 30, 1902, under laws of Arizona, with capitalization $1,000,000, shares 50c. par. Dr. Walter H. Parker, president; John Laughrey, vice-president and general manager; Chas. B. Lamont, secretary; M. E. Roberts, superintendent. Lands, 17 claims, also sundry miscellaneous lands, giving a total area of 640 acres, in the Silver Crown district, showing 6 veins of about 8′ average width, opened by 18 shallow shafts and pits and giving average returns of about 7% copper from oxides, carbonates, chlorides and sulphides, with occasional native copper.

GREAT VERDE CONSOLIDATED MINE. **CALIFORNIA.**

Office and mine: Sisson, Shasta Co., Cal. Is a co-partnership, capital $20,000, with 4 owners. John Reed Lyle, secretary and treasurer. Lands, 12 unpatented claims, on the Iron Mountain copper belt of Shasta county, adjoining the Balaklala mine, showing a fissure vein or lense with an estimated average width of 80′ and length of 5,000′, carrying chalcopyrite giving assays of 6% copper, $7 gold and 6 oz. silver per ton. Has 5 tunnels, longest 150′, and sells ore to the Keswick smelter of the Mountain Copper Company.

GREAT WESTERN COPPER CO. **ARIZONA.**

Office: Clinton, Iowa. Mine office: Tombstone, Cochise Co., Ariz. Capitalization, $1,000,000. W. J. Young, Jr., president; Paul B. Warnekros, manager; F. W. Knapp, superintendent. Lands, 23 adjoining claims, showing argentiferous copper ores, in the Dragoon Mountains. Has steam and gasoline power and is understood to have a leaching plant.

GREAT WESTERN COPPER CO. **NEVADA.**

Office: 113 Devonshire St., Boston, Mass. Letter returned unclaimed from former mine office, Reno, Washoe Co., Nev. Organized 1901, with capitalization $1,000,000, shares 10c. par. Geo. D. Burton, president; Frank B. Cox, secretary. Lands, 62 acres, in the Pea Vine district. Has steam power, with 2 shafts, deepest 200′, also an 800′ tunnel. Vein claimed to range 2′ to 17′ in width and to give assays of 12% copper, with gold values.

GREAT WESTERN GOLD COMPANY. **CALIFORNIA.**

Office: 506 Continental National Bank Bldg., St. Louis, Mo. Mine office: Redding, Shasta Co., Cal. Capitalization $10,000,000, shares $1 par. About $7,000,000 of stock has been issued at 10c. per share. Promoters are supposed to have retained a commission of 50% on stock sold. T. S. Henderson, president; O. E. Adams, vice-president; W. G. Scott, general manager; P. H. Noel, secretary and treasurer; M. E. Dittmar, consulting engineer. Company states that total indebtedness at close of 1903 was only $5,000, payable July, 1904, with all lands and machinery paid for. Lands include the Afterthought mine, the Liberty group, 10 groups of miscellaneous claims and a lease on the Garcia mines, in Arizona. The Afterthought mine, area 459 acres, in the Furnaceville district, 20 miles east of Redding, is much the most important of the company's holdings. Developments by former owners include a 300′ shaft and 7 tunnels, with aggregate length of about 2,000′, showing a large body of sulphide ore, mainly of medium grade, with frequent occurrences of high-grade ore. Company claims ores will average about $30 per ton in copper, gold and silver values, and plans to develop the mine by a double-track working tunnel. The deed of the Afterthought mine was filed in December, 1903. Title of the Liberty group, near Redding, is apparently in dispute. This property carries auriferous copper ores of undetermined values.

A 175-ton Allis-Chalmers furnace was on the ground in the summer of 1903, and in October, 1903, a contract was let to burn 100,000 brick, for the proposed smelter.

This property was promoted by T. S. Henderson & Co., of St. Louis, who issue imitation typewritten letters a yard or two in length, printed on both sides. The purchase of the Afterthought was an afterthought on the part of the company, but this property constitutes practically the entire value of the company's holdings. The Afterthought was bought for $150,000, with a rake-off of $60,000 to one J. J. Chambers and associates, considerable litigation resulting therefrom, as Chambers was the manager of the company when the Afterthought was purchased. The company has made very extravagant promises and has issued exaggerated statements. The Afterthought is regarded as a very promising mine, by the best judges acquainted with the property, but the methods of the company are open to censure.

GREAT WESTERN GOLD & COPPER CO. **UTAH.**

Mine office: Park City, Summit Co., Utah. David Evans, general manager. Lands adjoin the Daly Judge, showing vein-matter of about 100′ width, giving assays of 3% to 5% copper. Company plans driving a 2,000 tunnel to cut this ore body at a depth of about 1,500′.

GREAT WESTERN GOLD & COPPER MINING CO. **MONTANA & COLORADO.**

Office: care of W. J. Willingham, Equitable Bldg., New York. Chas. G. Eckert, president; Organized under laws of South Dakota, with capitalization $500,000, shares $1 par. Has a bond and lease on a gold claim at Cripple Creek, Colo., also one claim, area 20 acres, near Butte, Silver Bow Co., Mont. Latter considered promising, but company lacks funds for its proper development.

CHARLES A. GREEN. **MEXICO.**

Office: Houghton, Mich. Mine office: Montezuma, Chihuahua, Mex. Lands, 17 pertenencias, with a small amount of development work, showing a promising copper ore body.

GREEN HOPE MINING & MILLING CO. **WYOMING.**

Office: Omaha, Neb. Mine office: Guernsey, Wyo. Lands are in the Hartville district of Wyoming. Company said to plan erection of a 200-ton smelter, at Guernsey.

GREEN MONSTER MINE. **NEVADA.**

Mine office: Sandy, Lincoln Co., Nev. Owned by Mrs. Phoebe Hearst, San Francisco, Cal. Frank O. Wilkinson, superintendent. Has a 325′ shaft. Ores carry copper, silver and lead. Mine said to have $200,000 worth of ore carrying $39 per ton in copper and silver in sight. Employs 10 to 15 men. Erection of reduction works planned.

GREEN MOUNTAIN MINE. **CALIFORNIA.**

Office and mine: Lewis, Mariposa Co., Cal. O. R. Sydney, owner and manager. Mine produced a considerable amount of high-grade oxide and carbonate ores before closing in 1863, and had quite extensive development, showing an ore body of large size. Mine supposed to have been reopened recently, on a small scale.

GREEN MOUNTAIN MINE. **COLORADO.**

Said to be near Parkdale, Fremont Co., Colo., but letter to that address returned unclaimed. W. E. Johnson, owner.

GREEN MOUNTAIN COPPER CO. **NEW MEXICO.**

Office: 1013-135 Adams St., Chicago, Ills. Mine office: Rinconada, Rio Arriba Co., N. M. Employs 12 men. Adrian Vandercloot, president; F. E. Roberts, Jr., secretary; T. F. Woody, mine manager. Organized March 18, 1903, under laws of New Mexico, with capitalization $2,000,000, shares $1 par; unissued, $218,100. Lands, 8 claims, area 180 acres, in the Copper Mountain district. Veins are two contacts between slate and quartzite, said to average 30′ wide and to be traceable 4,000′, giving assays of 4% to 37% copper, 80c. gold and from a trace to 800 oz. silver per ton, from carbonate and oxide ores. Has 13 shafts, deepest 250′, also 210′ tunnel and an open cut with 758′ of underground development, estimated to show 40,000 tons of ore. Nearest railroad, 8 miles. Company contemplates erection of 100-ton leaching plant.

GREEN MOUNTAIN COPPER MINING CO. **WYOMING.**

Property sold to Saginaw Valley Copper Co.

GREEN MOUNTAIN MINING & MILLING CO. COLORADO.

Office: 519 Frick Bldg., Pittsburg, Pa. Mine office: Silver City, San Juan Co., Colo. Jos. Lee, president; S. J. Crawford, secretary; Jas. A. Snedaker, general manager. Organized under laws of Colorado, with capitalization $3,000,000. Lands, 19 claims, area about 200 acres, 7 miles from Silverton, with tunnels of 600′ and 800′, and about 4,000′ of underground development. Ore said to average about $12 per ton. Has steam power and 12-drill Rand air compressor.

GREENBACK MINE. CALIFORNIA.

An old property, said to be of value, about 35 miles from Bakersfield, Kern Co., California.

GREENE CONSOLIDATED COPPER CO. MEXICO.

Office: 24 Broad St., New York. Mine office: La Cananea, Sonora, Mexico. Organized 1899, under laws of West Virginia, with capitalization $7,200,000, shares $10 par. W. C. Greene, president; Mark L. Sperry, vice-president; Anson W. Burchard, second vice-president and comptroller; Geo. S. Robbins, secretary; Philip Berolzheimer, treasurer; W. C. Greene, M. L. Sperry, Edw. B. Tustin, Myron M. Parker, Philip Berolzheimer and Anson W. Burchard, executive committee; Charles Adsit, Thos. H. Anderson, Barnard M. Baruch, Emil Berolzheimer, Henry F. Blont, Anson W. Burchard, H. E. Huntington, John W. Gates, W. C. Greene, Edwin Hawley, Henry Ollesheimer, Myron M. Parker, Frank H. Ray, Edward C. Rice, J. B. Showalter, Alfred Romer, L. C. Weir, H. S. Black, Mark L. Sperry, Edw. B. Tustin and Jacob Weidman, directors; John T. Morrow, general manager; Arthur S. Wright, consulting engineer; John McHenry, mine superintendent; David Cole, concentrator superintendent; K. J. Williams, smelter superintendent. The mining lands of the company include 4,214 pertenencias of one hectarea each. equivalent to 10,408 acres, the tract having a boundary line of 32½ miles. The tract includes about 40 old mines and prospects and is located in the Cananea mountains, in the free zone of northern Sonora, about 20 miles south of the Arizona border. The Cananea range is about 25 miles in length and 6 to 10 miles in width, with a northwest and southeast axis, divided into two plainly marked and nearly equal sections by Puertecetos Pass, the Greene mines being in the southern half of the range and on a mineral belt apparently having a strike nearly parallel with that of the range. Careful investigation of the geology of the Cananeas shows marked evidence of strong volcanic action in the past. In addition to its mining lands, the company also holds 486,000 acres of timber and grazing lands, the latter under 8-year lease to the Cananea Cattle Co. The mines are in the municipality of Ronquillo and the principal administrative buildings are in that municipality, near the smelter. The company has also platted the townsite of La Cananea, on the mesa to the eastward of Ronquillo, and therein are located the best dwellings, hotels and public buildings. The company holds franchises for electric light, water, ice, traction and telephone services, and is preparing to build a street railway from Chivatera to La Mesa, a distance of about three miles. There has been considerable litigation over titles, but the lands were redenounced in 1902 and the Cananea Consolidated Copper Co., S. A., now holds title direct from the Mexican government. The property of the Greene Consolidated Copper Co., consists of practically the entire stock issue of the Cananea Consolidated Copper Co., S. A., which is registered and protocolized in Mexico.

The ores of the Greene are of great variety and extent, including oxides, carbonates and sulphides, with frequent native copper, occurring for a distance of 7½ miles along the company's main tract. The ores contain no refractory elements in important quantities, but are largely silicious, requiring concentration and the use of considerable quantities of barren limestone and iron ore for fluxing. The ores occur in altered sedimentary rocks in shear zones, and are perhaps the largest contact deposits ever uncovered as yet. There are large gossan outcrops, but appearances are deceptive, and much of what appears to be gossan at a short distance is really weathered conglomerate showing red and green stains closely simulating the iron colors. The ore bodies show no weakening at depth, all reports to the contrary notwithstanding. The statements frequently appearing in print that the rich oxide and carbonate ores are exhausted are ridiculous. From personal inspection I can assure shareholders that there are rich oxide and carbonate ores developed for years to come.

The mineral holdings of the Greene are divided into 5 zones, these being the Cobre Grande, Veta Grande, Esperanza, Capote and Puertecitos, each of these zones including a number of different mines. The Cobre Grande is practically idle, the principal production coming from the Capote, Veta Grande, Puertecitos and Esperanza zones, in about the order named. The mines are a network of shafts and tunnels, with eight main working shafts and as many main tunnels.

The Cobre Grande, which was the original mine of the property, and was worked in a crude way for many years by the Pesqueria family, is now the least important of the series. No. 4 shaft is being sunk with a small force. This zone shows concentrating ore only, and while the mine has more than a mile of underground openings, the production is slight, as its ores, while by no means to be despised, are inferior in grade to those found in profusion and more readily accessible elsewhere.

The Veta Grande has an enormous ore body with a pitch of 36° and a strike of 42°. At the time of my visit, in June, 1903, this ore body had a proven depth of 824′ with an average length of 726′ and an average width of 216′, giving at a minimum estimate of 6,000,000 tons of ore, apparently averaging better than 10% copper. Since that time another level, opened 100′ deeper than the former workings, proves fully up to the average grade. The Veta Grande ore is mainly soft chalcocite with a gangue of talc and occasional massive quartz, carrying large quantities of native copper and a small amount of iron pyrites, with a little massive chalcocite. Extraction is principally through a 986′ double-track tunnel, but the new Veta Grande tunnel No. 9, started in 1903, is planned to serve both the Veta Grande

and Oversight mines, and will accommodate 10-ton electric trai
dition to the main ore body previously referred to, there is a 15
on the hanging wall, ranging 3% to 6% in tenor, the silicious porti
are used for converter linings. This mine is all timbered with
and worked-out stopes are filled in with waste. The ore is mi
sections, leaving 100′ slices unmined, and as the worked-out stop
in, it will be possible to mine out the untouched portions when t
tions are exhausted, unless the surface should be stripped previ
Veta Grande ore bodies are overlaid by a heavy felsite capping
to contain 830,000 cubic yards, and the management is conside
visability of stripping off this surface rock. Present mining cos
per ton in the Veta Grande and it is estimated that nearly $2 per t
$12,000,000 on the ore already developed, could be saved by st
working the entire ore body open-cast. No. 5 shaft on the V
has 3 compartments, working two of these in balance with a 115-
hoist good for 1,000′ depth. This shaft has a 7-drill air compres
timber-framing shops, etc.

The Oversight mine has large bodies of ore ranging up to
and will be served by Veta Grande tunnel No. 9, which will interse
sight ore body at a depth of 1,046′ below the crest of the mo

The Capote zone, including a number of mines, is the princip
of the Greene Consolidated and has about a mile of vertical o
some 6 miles of horizontal openings, requiring upwards of 10,00
daily for underground use. The four principal shafts are kno
2, 4, 6 and 8, the deepest being about 900′, but like the other
Capotes produce principally through tunnels. The ore is rather
nature, consisting essentially of iron pyrites with a coating of c
the form of extremely thin films, the copper-coated iron pyrites
thin crystalline grains scattered quite uniformly through immen
talc. The Capote ore is highly silicious and requires careful conc
secure the best smelting results. The main working level of the
has a double-track tunnel connecting shafts Nos. 2, 4, 5 and 7 at
distance of 2,900′. The Capote ore body has a minimum width
a maximum width of 225′ and is estimated by the company to h
11,000,000 tons of ore, although this estimate might be increa
damage to the truth. No. 2 shaft has a 110-h. p. hoist and No. 4
erful double hoist good for a depth of 3,000′ also a 7-drill air
and a 50-kw. direct-connected generator furnishing light and po
Capote workings. The Elisa mine, 1,500′ south of No. 2 Capote
duces a silicious chalcopyrite rich in gold and silver. On the se
of the Elisa the vein is about 20′ wide for a distance of some 50
ages 4% to 6% copper, while on the third level the vein has abo
width and carries 8% to 10% copper. The main shaft at the Eli
depth.

The Esperanza zone, as yet but slightly developed, is kno good ore bodies, and will probably be worked from the Capote shafts at a depth of 500′ to 600′.

The Puertecitos zone, the westernmost of the group, is about 4 miles northwest of the Elisa shaft of the Capote, and is much the largest ore deposit yet developed by the Greene. The ore body is of immense size, having an outcrop about 800′ wide. The upper workings show considerable malachite, azurite, and occasional cuprite and native copper, but the principal values at a little depth are in chalcopyrite, with occasional bornite, in a lime-alumina-garnet gangue. The workings of the Puertecitos zone are known as the Ventura, on the east, Juarez 1,200′ next west and Elenita, 900′ west of the Juarez. The deepest shaft is the Ventura, about 700′ in depth and the Elenita has exposed very rich ores in grading for surface structures. These shafts have developed ore sufficient to render each in itself a very large mine. The total underground openings of the Greene Consolidated at the close of 1903 were probably about 18 miles in length, and are being increased rapidly.

The main power plant, near the smelter, has a 65x245′ engine-house and a 46x216′ boilerhouse, both of steel with iron sides and roof, the boiler-house having coal-bunkers with a storage capacity of 3,500 tons. The power plant has 3 engines with direct-connected 100-kw. dynamos, and one 200-kw. direct-connected dynamo, giving a total of about 700 h. p. This plant furnishes a 250-volt current to operate the various shops, briquetting plant, silica mill, electric cranes, etc., and also furnishes light for all mine buildings and for the towns of La Cananea and Ronquillo. The machine shop, also of steel frame, is excellently equipped with the most modern machinery and supplemented by a foundry having a 2-ton casting cupola. The carpenter shop and plaining mill have a complete sash-and-door equipment and all necessary woodworking machines and tools. The warehouses are large and carry heavy stocks. Pneumatic tools are used extensively, power being furnished by Rand compressors.

The concentrator, on a hillside between the mines and smelter, is built in two independent sections of 300-tons daily capacity each. All material is handled by gravity, after being dumped into bins from narrow-gauge cars. The building has 3,400 sq. ft. of floor surface, and for each section the equipment includes one set of 36x14″ Davis rolls; 2 sets of 27x14″ Allis-Chalmers rolls: two 18″ bucket elevators; 10 trommels; four 36″ single Hartz jigs; two 36″ double Hartz jigs; 22 concentrating tables; 4 slime tables; 18 Frue vanners and 3 Bryan mills for regrinding. The material is treated by wet crushing and water concentration, and much of the silicious concentrates must be briquetted before smelting. The concentrator power-house has four 100-h. p. boilers and a tamden compound 250-h. p. condensing engine, with a 300-ton coal bin and 200,000-gallon water storage tanks, the concentrator using about 200 gallons of water per ton of ore.

The first concentrator has not proven a success, and inasmuch as it is also inadequate for the present needs of the property, a new and larger concentrator is being built just above. The new concentrator is three times the size of the old, and will give a total concentrating capacity of 2,400 tons

hospital at Chivatera. The mercantile plant includes a brick store, car
an immense stock, with warehouses having direct railroad connection, a
branch store at Chivatera. The company also owns and operates the B
de Cananea, organized January, 1902, with a capital of $200,000, Mex
which does a large and highly profitable business, Ignacio Macmanus
cashier. There is also a brickyard with a daily capacity of 35,000
and the company maintains a telephone system having about 200 mile
wire and about 100 phones, also an independent telephone system use
dispatching on the narrow-gauge railway. There are two sawmills w
combined capacity of 14,000 feet daily, cutting lumber from the comp
timber lands.

The mines and works are connected by an 11-mile 36″ gauge private
road, laid with 35-lb. and 45-lb. steel rails and equipped with two 2
Porter and one 38 and one 40-ton Baldwin locomotives, with ten 25-ton
twelve 30-ton steel ore cars, 3 coke-cars, 4 flat-cars, 2 box-cars and a cab
This railroad was excessively crooked and had some 5% grades, conseq
the locomotives could haul but three loaded cars. The line is being re
throughout with much easier grades and curves, which will double the
ing capacity of each locomotive. Railroad connection with the outside
is over the Ferrocaril Cananea, Rio Yaqui y Pacifico, built by the com
and sold to the Southern Pacific, a 25-year freight contract made at the
of the sale assuring very favorable freight rates.

The question of fuel is always an important and frequently an u
one with mines in Northern Mexico and the American Southwest. The Gr
endeavors to carry a 90-day stock of coal and coke, to guard against st
floods and other contingencies, and keeps two fuel agents between the
and the coal mines to expedite shipments and receipts.

One of the most serious problems in the development of the
property was that of water supply. Potable water is piped from
Canyon and a little water was secured from the Capote and Cobre
shafts. It soon became apparent, however, that the water supply
carious and consequently a costly but necessary plant has been ins
settle the water question for all time. The new pumping plant is
Agua, on the headwaters of the Sonora river, 9¾ miles from the mi
pumps have capacity to force 1,750,000 gallons daily through a
pipe-line, against a head of 967′, to a reservoir on the hills above
whence water is delivered to the mine, reduction plant and tow
substantial working pressure. The water system of the company
25 miles of mains, ranging in size from 2″ to 10″, and owing to
securing water, it is clarified and re-used wherever possible.

The mines and smelter employ upwards of 4,000 men, ab
whom are Mexicans, with several hundred American skilled
about 300 Chinese. Wages average $3.50 to $4 gold per day f
and about $3 silver per day for Mexican miners. These are
wages paid native workmen by any Mexican mine.

For the year ending July 31, 1903, the smelter treated 3 ore, producing therefrom 43,228,120 lbs. of copper; 397,425 oz. of silver and 2,391 oz. of gold, these products having a total value of $4,657,064, and making a net mining profit of $1,035,267. Miscellaneous income from stores, bank, rentals and real estate was $211,557 and administrative expenses were $426,359, leaving an actual net profit of $820,464, in addition to which the company had on hand and in transit copper to the market value of $462,037, which, added to the preceding net earnings, would give net profits of $1,282,501. These figures show an average return of 6.48% copper, 1.2 oz. silver and 14c. gold per ton, secured at a cost of 7.45c per lb. for copper, including gold and silver values. For the year 1903 the production of copper was 45,388,000 lbs., the December production being 4,616,000 lbs. Refining and selling expenses are about 1¾c per lb. and as electrolytic treatment costs $15 per ton, the cost of transportation and selling commissions would be about 1c. per pound, and general expense and interest cost another cent per pound. These costs undoubtedly can be decreased when the company gets in a little easier financial position.

The Greene Consolidated paid 2% dividends in January, February and March, 1903, a total of $432,000 for the year. Two dividends were paid previously, but the payment of dividends was wisely discontinued after May, 1903, as the company needs money for improvements and working capital. At the end of 1903 it was proposed to sell $2,800 000 of 6% 15-year collateral trust bonds, convertible into stock at par, thus eventually increasing the capitalization to 1,000,000 shares of the par value of $10. There is strong opposition to this plan, which may not carry. The proceeds are required, ostensibly, for an increase in smelting capacity. For the fiscal year ending July 31, 1903, the company reduced outstanding bills payable from $2,415,685 down to $247,758, and the balance sheet showed total current assets of $1,451,727, with current liabilities of $1,172,249.

There is no other mining property in the world about which so many lies are told and none other against which such a systematic campaign of slander is in progress. Every effort is being made by parties closely affiliated with the Standard Oil-Amalgamated interests to oust Col. Wm. C. Greene from the management of the property, and rumors of his resignation, forced or otherwise, are put in circulation every month or two. The plan of campaign against the Greene Consolidated and its president includes the circulation of lies of every sort, ranging from financial lies, which, of course, do not count in high finance, down to personal slanders against Col. Greene. There has recently been a recrudescence of stories to the effect that serious litigation imperils the validity of the Greene holdings, but these tales are absolutely untrue. The litigation of the past is almost entirely settled, and the titles of the company are now unimpeachable. The importance of Col. Greene's personal litigation has been greatly exaggerated, and in any case this does not effect the titles of the company. The property has been developed with unexampled rapidity, and never before in the history of the world has a copper mine been opened to a productive capacity of 4,000,000 lbs. monthly within two and a half years, as was the case with the Greene.

In such rapid work, conducted upon such an immense scale, errors were u avoidable. Many of these were made, but they are being remedied as rapid as possible, and no management could have avoided mistakes in openi and equipping so large a property in so short a time. The Greene is o of the very largest and richest mines ever opened, and will certainly becon an enormous dividend-payer. Its present management is perfectly capab of handling the property to the best interests of its shareholders, now abo 3,000 in number, and is much to be preferred to the Amalgamated manag ment, which seems to have entirely forgotten the rights of shareholders the conduct of the Montana mines held by that corporation.

COMPANIA MINERIA GREGORIA. **MEXIC**

Letter returned unclaimed from Minillas, Zacatecas, Mexico.

GREGORY-BUELL CONSOLIDATED GOLD MINING & MILLING CO. **COLORAD**

Mine office: Central City, Gilpin Co., Colo. Property is the Buell mi carrying ores of gold, silver and copper. Has steam power and a 45-sta mill, employing about 25 men.

GREYHOUND GROUP. **IDA**

Mine office: Challis, Custer Co., Idaho. A group of 12 claims, on K stone Mountain, about 6 miles from Challis. Supposed to be under b to New York parties.

GREYTON COPPER MINES CO. **WYOMI**

Office: care of Thos. Potter, secretary, Denver, Colo. Organized Janua 1902, with capitalization $75,000, shares 5c. par. W. H. Kistler, preside Lands, 12 claims, in the Encampment district of Carbon county, Wyomi near the Colorado line, opened by sundry pits and shallow shafts, deep 70', showing cuprite and copper sulphides.

GRIBBELL ISLAND COPPER CO. **BRITISH COLUMB**

Office: Fairhaven, Wash. Property, on Gribbell Island, Skeena Ri Division, Cassiar District, B. C. Company worked about 40 men in 19 and also worked steadily in 1902.

GRIFFITH CONSOLIDATED MINE. **COLORA**

Mine office: Georgetown, Clear Creek Co., Colo. Hood & Maxw owners; Will C. Hood, superintendent. Ores carry gold, silver, lead a copper. Employs about 15 men.

GRIGGSTOWN MINE. **NEW JERS**

An old property at Griggstown, Somerset Co., N. J. Reopened 1901, but presumably idle again, as letters to that address were retur unclaimed.

GUILLERMO GRUNDY. **PE**

Mine office: Musquituni, Lampa, Peru. Operates a mine secur a limited production of copper and silver.

GUADALUPANA MINE. **MEXI**

Mine office: Topia, Durango, Mex. Felix Briones, owner. Ores ca copper and silver. Employed about 40 men at last accounts.

GUADALUPANO MINING CO. **MEXICO.**

Mine office: Torres, Sonora, Mexico. H. H. Douglas, manager. Employs about 100 men. Has silver-lead-copper ores, developed by shaft. Has steam power and a 20-stamp mill.

GUADALUPE MINE. **MEXICO.**

Mine office: Muleros, Durango, Mex. José B. Nava, owner. R. Romo, manager. Development is by open-cut, on a considerable body of copper ore. Mine is said to employ 50 to 75 men.

GUANAJUATO COPPER CO. **MEXICO.**

Supposed to have copper claims in the vicinity of Guanajuato, Mexico.

GUAYNOPA SMELTING & REDUCTION CO. **MEXICO.**

Office: care of Daugherty & Albers, 69 Wall St., New York. C. B. James, president; James H. McKinnell, secretary and treasurer. Organized under laws of South Dakota, with capitalization $1,000,000, shares $1 par. Lands, 54 claims, area 133 acres, in Guaynopa Cañon, State of Guerrero, Mex. Company was paying dividends of 1% monthly, at last accounts. Ore values, mainly silver, with 5% to 8% copper. Company supposed to be building a smelter.

GUGGENHEIM EXPLORATION CO. **MEXICO & COLORADO.**

Office: 71 Broadway, New York. General mine office: Tiburcio, 27, Mexico, D. F. Company has very close affiliations with the American Smelting & Refining Co., apparently acting as a retriever by developing mines which supply ores to the latter named company's various smelting plants. Organized June, 1899, under laws of New Jersey, with capitalization $17,000,000, shares $10 par; issued, $10,500,000. Daniel Guggenheim, president; Morris Guggenheim, vice-president and treasurer; W. W. Porter, secretary; E. M. Rogers, general manager. Annual meeting, first Tuesday in June.

The Silver Lake mines, at Silverton, San Juan county, Colorado, produce ores of gold, silver, lead and copper, and have steam, water and electric power, with a 400-ton concentrator and employ about 200 men.

The Santa Maria y Anexas, at Velardena, Durango, Mexico, have auriferous and cupriferous silver-lead ores, extensively opened. The mines have steam and gasoline power and a 500-ton smelter, employing about 600 men.

La Gibosa y Anexas, at Jiminez, Chihuahua, Mexico, were bought 1903. L. M. Soule is superintendent.

The Mina Tepezalá at Tepezalá, Aguascalientes, Mexico, has silicious silver-copper pyrites, opened by a 560′ main shaft. Robt. Brendell, superintendent. Has a good power plant and employs several hundred men.

The Dolores y Anexas, at Matehuala, San Luis Potosi, Mexico, include the Dolores, Trinidad, and Azul mines, employing about 500 men. W. E. Upham, superintendent; P. A. Babb, engineer. Lands, 93 pertenencias, area 230 acres. Veins occur as contacts between limestone and porphyry, carrying sulphide ores with garnetiferous gangue returning an average of 8% copper, 7 oz. silver and $2 gold per ton. The San Miguel shaft is

500′ deep and the San Miguel tunnel is 1,500′ long, the mine having about 8,000′ of underground openings. Has gasoline power and is reached by the Porvenir de Matehuala railroad. Production of copper in 1902 was 2,481,832 lbs., from 17,756 metric tons of ore treated, giving an average return of 6.34% copper, and in 1903 the production was about 5,200,000 lbs. The official Mexican figures of 1902 copper production by the Guggenheim Exploration Co. are 1,462 metric tons.

GULF CREEK, LTD. **AUSTRALIA.**

Offices: 6, Draper's Gardens, London, E. C., Eng. Mine office: Barraba, N. S. W., Australia. Hon. Arthur George Brand, M. P., chairman; W. L. Bell, mine engineer; Geo. S. Burton, secretary; Walter Bell, general manager. Registered August 1, 1899. Capital, nominal, £3,000; debentures, £10,000 at 6%. Property, 250 acres, in the Gulf Creek district of the Barraba division, N. S. W., 350 miles north of Sydney and 72 miles from a railroad. Ore bodies include a 9′ vein of 7% sulphide ore, also a 10% lense of sulphide ore 25′ wide and 350′ long. Ore is very heating, being rich in copper. Country rocks are indurated clay-stones, of Carboniferous age, with dikes of serpentine. Has steam power and 30-ton smelter, employing about 150 men. Production for 1901 was 560 long tons refined copper, from 9,400 tons of ore smelted.

GUM TREE GOLD MINING & MILLING CO. **COLORADO.**

Mine office: Idaho Springs, Clear Creek Co., Colo. J. F. Antisdale, superintendent. Ores carry gold, silver, lead and copper. Has steam power and employs about 15 men.

GUNN'S PEAK COPPER MINING CO. **WASHINGTON.**

Office: 217 Columbia St., Seattle, Wash. Mine office: Index, Snohomish Co., Wash. A. M. Watt, superintendent. Lands, 4 claims, showing veins carrying chalcopyrite giving average assays of 11% copper and about 2 oz. silver per ton. Has about 500′ of development, by tunnels and crosscuts.

GUNSIGHT GROUP. **ARIZONA.**

Claims lying near the Crescent property, in Tombstone Canyon, north of Bisbee, Cochise Co., Ariz. Said to be bonded for $35,000.

GWIN MINE DEVELOPMENT CO. **CALIFORNIA.**

A property in Calaveras county, California, now operated as a gold mine, which has a large body of low-grade copper ore that will be worked eventually, in all likelihood.

GWYNANT COPPER MINES CO., LTD.

Offices: 34, Copthall Ave., London, E. C., Eng. J. K. Lamont, secretary. Capital, nominal, £30,000. Location of mining property, if any, not learned.

GYMPIE COPPER MINES, LTD. **AUSTRALIA.**

Offices: Salisbury House, London Wall, London, E. C., Eng. Mine office: Gallangowan, Fitzroy Co., Queensland, Australia. Lieut.-Gen. Sir J. B. Edwards, chairman; M. T. Wigham, secretary. Registered March 27, 1900. Capital, nominal, £150,000; issued, £130,007. Lands, 120 acres leasehold and 80 acres under option. On Lot 25 a 15′ vein giving assay values of £6 per ton was opened. Idle at last accounts.

HAGGARTY-JORDAN MINING CO. **WYOMING.**

Office: Watertown, N. Y. Mine office: Battle, Carbon Co., Wyo. Organized 1901, under laws of Delaware, with capitalization $150,000, shares 10c. par. C. H. Dunbar, president; Delos S. Dunbar, secretary and treasurer; C. W. Jordan, superintendent. Lands, 11 claims, area 220 acres, in the Battle Lake district, showing 4 fissure veins, of which 2 are being developed, these averaging 4′ wide and giving estimated average values of 35% copper, a trace of silver, and $5 gold per ton, from carbonate and sulphide ores. Has very limited underground development.

HALIFAX COPPER CO. **VIRGINIA.**

Office: Virgilina, Halifax Co., Va. Was a small shipper in 1900.

HALL MINING & SMELTING CO. **BRITISH COLUMBIA.**

Offices: 1, Leadenhall St., London, E. C., Eng. Mine office: Nelson, B. C. Employs about 250 men. Registered June 6, 1900, as reorganization of Hall Mines, Ltd., with capital, nominal, £325,000; issued, £275,000. Debentures, £50,000 authorized; issued, £24,560 first-mortgage 6% bonds, redeemable at 105 on 6 months' notice, at option of company. Lord E. Hamilton, chairman; C. Harvey, consulting engineer; A. E. Ashley, secretary; J. J. Campbell, business manager; J. R. Gifford, mine manager; Robt. H. Hedley, smelter superintendent. Lands, 506 acres, on Toad Mountain, including the Silver King, Hall and Highland mines. Has also leased the Emma mine, near Summit, for a supply of fluxing ore. Mines have auriferous and cupriferous silver-lead ores. Percentage of copper from the Silver King mine has decreased from 6.5% to 3.8%, the Silver King, carrying bornite above and argentiferous tetrahedrite below, the lower levels not looking so well as the upper workings.

The smelter, at Nelson, near the mine, has one large and one small furnace, with hand and mechanical roasters, but is not thoroughly modern. Product is an auriferous and argentiferous lead-copper matte of 33% to 50% in tenor. Mine and smelter have both steam and electric power. For year ending June 30, 1903, production was 3,350 tons of lead, 112 tons copper, 1,023,250 oz. of silver and about 8,000 oz. of gold, value of production being £149,163, giving a net loss of £954 on the year's operations.

HALLIWELL COPPER CO. **MICHIGAN.**

Office: Cleveland, Ohio. Idle at present. Organized 1901, under laws of South Dakota, with capitalization $3,000,000, shares $1 par, nonassessable. Louis Poplowsky, president; A. H. Weed, vice-president; Chas. W. Voth, secretary; C. F. Uhl, treasurer; H. H. Reeves, superintendent. Lands, 880 acres, in Carp Lake Twp., Ontonagon Co., Mich., carrying sundry copper-bearing amygdaloids. Has two shafts, of 130′ and 190′ and tunnels of 190′ and 200′. Has steam power. Is 17 miles from the Chicago, Milwaukee & St. Paul railway. Company contemplates sinking shafts on the Noble and Black Amygdaloid lodes, and plans resuming work in spring of 1904.

CLEMENTE HAM. **MEXICO.**

Mine office: Promontorios, Alamos, Sonora, Mex. Is a producer of copper ores, which are smelted to matte near mine. Production in 1902 was 191.2 metric tons of matte, probably averaging about 55% in tenor.

HAMILTON MINE. **MICHIGAN.**

See Copper Crown Mining Co. (of Michigan).

HAMILTON MINING, MILLING & TRANSPORTATION CO. **COLORADO.**

Mine office: Winfield, Chaffee Co., Colo. John G. Paine, superintendent. Ores carry copper, silver and gold. Mine opened by shaft and tunnel.

HAMLEY MINES. **AUSTRALIA.**

Office: care of John S. Scott, secretary, Grenfell St., Adelaide, South Australia. Mine office: Moonta, Yorke Peninsula, South Australia. Opened 1861, and formerly known as the Karkanullo mine. Deepest shaft, 1,020' in 1899. Ores, bornite and chalcopyrite, yielding 1 to 4 tons copper per fathom of ore broken. Production, 100 to 150 tons yearly.

HAMMOND COPPER CO. **MONTANA.**

Letter returned unclaimed from former office, 18 Broadway, New York. Lyman M. Loomis was president and treasurer, and Joseph Howard, secretary. Last heard of company was a charge of fraud preferred against officers by a Baltimore shareholder.

HAMPDEN COPPER MINES. **AUSTRALIA.**

Mine office: Cloncurry, North Queensland, Australia. Has large bodies of sulphide ore, 528 tons of ore shipped to smelters at Wallaroo in 1901, having averaged 36.5% copper. Cannot be worked profitably without railroad connections, or smelter at the mines.

HAMPTON MINE. **COLORADO.**

Mine office: Central City, Gilpin Co., Colo. W. C. Hughes, manager. Ores carry gold, silver and copper. Has steam power and employs about 15 men.

HANAWA MINE. **JAPAN.**

Owned and operated by the Mitsu Bishi Gosshi Kwaisha.

HANCOCK MINES CO. **NEW MEXICO.**

Letter returned unclaimed from former office, St. Louis, Mo.

HANCOCK MINING CO. **MICHIGAN.**

Office and mine: Hancock, Houghton Co., Mich. August Mette, agent. Area, 160 acres, much of which is now built over by the city of Hancock. Idle since 1885. Lode is narrow, but fairly rich. Total production, 2,854 tons, 1,384 lbs. refined copper.

HANE COPPER MINING CO. **MONTANA.**

Office: care of H. L. Elton, president, Butte, Silver Bow Co., Mont.

HANOVER COPPER CO.

Office: 1502-11 Broadway, New York. Organized under laws of South Dakota, with capitalization $1,000,000, shares $1 par. G. W. White, president and treasurer; R. K. Wartman, secretary. Company refuses to give location of property, if any, but states that no mining is being done.

HANOVER MINING & MILLING CO. **NEW MEXICO.**

Mine office: Hanover, Grant Co., N. M. Property understood to be under option to Philadelphia parties.

HAPPY CREEK MINE. **NEVADA.**

Mine office: Lovelock, Humboldt Co., Nev. Frank Reynolds, superintendent. Is claimed to have a ledge 60′ wide, in serpentine, giving assays of 37.5% copper, 20 oz. silver and $3 gold per ton, but these figures can be safely scaled 50 to 90 per cent.

HAPPY JACK MINING CO. **ARIZONA.**

Mine office: Patagonia, Santa Cruz Co., Ariz. W. H. Barnett, superintendent, at last accounts. Ores carry gold, silver, copper and lead. Mine is opened by shaft and tunnel.

HAPPY JOHN MINE. **BRITISH COLUMBIA.**

Mine office Alberni, Vancouver Island, B. C. Ores carry gold, silver and copper. Was developing with a limited force at last accounts.

HARDSCRABBLE MINE. **NEW MEXICO.**

Office and mine: Magdalena, Socorro Co., N. M. W. A. Brown, lessee. Employs about 50 men. A. C. Thomas, superintendent; Ed Brittonstone, mine superintendent. Property shows 9 veins, occurring as fissures in granite and contacts between granite and limestone, these being said to average about 25′ width and to carry ores averaging about 4% copper, 30% lead, 44% zinc, 12 oz. silver and $1 gold per ton, from cerussite, sphalerite and chalcopyrite. Mines have a 200′ shaft and several tunnels, longest 200′ and 300′, estimated to show 20,000 tons of ore, with 12,000 tons blocked out for stoping.

OTTO HARNECKER. **CHILE.**

Office and mine: La Ligua, Aconcagua, Chile. Property is the Peña Blanca mine, opened 1888, making the equivalent of about 150 tons of refined copper yearly. Has a small matting furnace.

HARRINGTON MINING CO. **ARIZONA.**

Mine office: Crown King, Yavapai Co., Ariz. Geo. P. Harrington, general manager. Operates the Tiger mine, producing ores of gold, silver and copper. Has steam power and employs about 20 men.

HARTFORD CONSOLIDATED COPPER CO. **CALIFORNIA.**

Has 10 claims, three miles north of Protem Creek, Shasta Co., Cal., showing an 8′ vein, carrying oxidized ores on surface, with a limited quantity of disseminated sulphides developed by 400′ of tunnels.

HARTFORD COPPER & GOLD MINING CO. **IDAHO & ALASKA.**

Office: 7 Exchange pl., Boston, Mass. Mine office: Challis, Custer Co., Idaho. Capitalization $2,000,000. Henry J. Wilkins, president; Chas. M. Thayer, secretary; John I. Minear, mine manager. Idaho property is 150 miles from a railroad, but is quite extensively developed, having about one mile of tunnels and drifts, longest tunnel being 900′. Has a 50-ton mill, working on low-grade ore, and ships more or less high-grade smelting ore, running $400 to $600 per ton. Also owns copper and gold claims on Prince of Wales Island, Alaska. Was paying quarterly dividends of 1% at last accounts. Company apparently is paying dividends and selling stock simultaneously.

HARVARD MINE. **ARIZONA.**

Mine office: Gilbert, Yavapai Co., Ariz. W. P. Hamlin, et al, owners; W. J. Gilbert, superintendent. Ores carry gold, silver and copper. Has gasoline power.

HATASA MINE. **JAPAN.**

Mine office: Hatasa-mura, Gugo-gori, Mino, Japan. An old property, opened previous to A. D. 1600, and once highly productive. Has 4 principal veins only 3" to 2' in width, carrying argentiferous copper and lead ores, associated with sphalerite, iron pyrites, etc. Production in 1900 was 165,416 momme of silver and 38,651 lbs. refined copper.

HATHAWAY MINE. **MEXICO.**

Mine office: Santo Domingo, Chihuahua, Mex. Lands, 18 miles south of Santo Domingo, show 2 small but persistent veins carrying rich sulphide ores. Has an old smelter, not in blast, and ships concentrates about 600 miles to Aguascalientes, for reduction.

HATTIE GOLD AND COPPER MINING CO. **IDAHO.**

Letter returned unclaimed from former address, Doniphan, Blaine Co., Idaho.

HATTIE BELL COPPER, GOLD & NICKEL MINING CO. **ONTARIO.**

Property sold to Consolidated Copper Co., of Parry Sound.

HAWKEYE MINE. **OREGON.**

Mine office: Comer, Grant Co., Ore. Byron Sherbindy, owner and manager. Ores carry copper, gold and silver. Has a small smelter and employs 15 to 25 men.

HAWKEYE COPPER MINING CO. **WYOMING.**

Office: 519 Equitable Bldg., Denver, Colo. Letter returned unclaimed from former mine office, Encampment, Carbon Co., Wyo. Joseph A. Michel, president and treasurer; Geo. C. Waterman, secretary. Organized 1900, under laws of Wyoming, with capitalization $500,000, shares $1 par. Lands, 2 claims, area 40 acres, developed by a 35' shaft.

HAWKSWORTH COPPER CO. **ARIZONA.**

Said to have 25 claims in vicinity of Agua Caliente, Maricopa Co., Arizona.

HAYFORD MINE. **ENGLAND.**

Offices: 150, Leadenhall St., London, E. C., Eng. Mine office: St. Ives, Cornwall, Eng. J. Allan, chairman; W. Spanswick, secretary. Capital, nominal, £5,000. Mines carry copper, lead and zinc.

HAYMAN MINING & TUNNEL CO. **COLORADO.**

Has a copper-lead property in the Lower Tarryall camp, about 25 miles northwest of Cripple Creek, Teller county, Colorado.

HEADLIGHT COPPER MINING CO. **WYOMING.**

Office and mine: Encampment, Carbon Co., Wyo. Chas. A. Finley, president; Philip Lee, secretary. Lands, 180 acres. Ore is low-grade and property was idle at last accounts.

HEADLIGHT GOLD MINING & MILLING CO. **COLORADO.**

Mine office: Spencer, Gunnison Co., Colo. L. C. Ehbeding, superintendent. Ores carry gold, silver and copper. Has steam power and employs about 10 men.

HEALDSBURG LODE. **CALIFORNIA.**

Office: care of J. G. Caldwell, manager, Healdsburg, Sonoma Co., Cal. Lands, 1 claim, 10 miles north of Healdsburg. Property opened, circa 1885, by tunnel.

HEART OF ARIZONA GOLD & COPPER CO. **ARIZONA.**

Office: 203 Chamber of Commerce, Detroit, Mich. Mine office: Prescott, Yavapai Co., Ariz. Organized 1902, under laws of Arizona, with capitalization $1,000,000.

HEATH MINING CO. **IDAHO.**

Mine office: Heath, Washington Co., Idaho. R. T. Wolliston, superintendent. Has steam, water and electric power. Ores carry gold, silver and copper.

HECLA MINES. **WASHINGTON.**

Office: care of F. Danel, 217 Columbia St., Seattle, King Co., Wash. Lands, sundry claims in vicinity of Seattle.

HECLA CONSOLIDATED MINING CO. **MONTANA.**

Office: Indianapolis, Ind. Mine office: Dillon, Beaverhead Co., Mont. Henry Knippenberg, president and general manager. Property includes the Atlantis, Cleve and other mines, carrying ores of gold, silver, lead and copper, producing about 100,000 lbs. of copper yearly, as a by-product.

HECLA COPPER & GOLD MINING, MILLING & SMELTING CO. **WYOMING.**

Office: 404 Kittredge Bldg., Denver Colo. Mine office: Hecla, Laramie Co., Wyo. Employs 10 to 12 men. Organized October, 1901, under laws of Wyoming, with capitalization $1,000,000, shares 5c. par. Henry Schwartz, president and general manager; Geo. C. Norris, vice-president; Louis Williams, secretary; Thos. H. O'Reilly, mining captain. Lands, 16 claims, 85 acres patented, with 45-acre mill and smelter site, total area 405 acres, in the Silver Crown district, showing 16 fissure veins, averaging 8′ width, in schist and granite, of which 3 are being developed, these averaging 7′ width and giving average assays of 5% copper and 3 oz. silver per ton, in addition to which they carry estimated average values of $10 to $12 per ton in nickel. platinum and uranium. Ores are oxides, carbonates and sulphides, opened by a 40′ tunnel and 14 shafts of 10′ to 140′ depth. Has steam power, 15-stamp mill, a 30-ton concentrator, 60x80′ in size, and a 20-ton smelter 2 miles from the mine. For 1904 the company plans continuing development by shafts and drifts and doubling the capacity of the concentrator. Management of the company is experienced and of good standing, and property is regarded as promising.

HECLA COPPER MINING CO. **WYOMING.**

Letters returned unclaimed from Manistee, Mich., and Encampment, Carbon Co., Wyo. Supposed to own 4 claims, area about 30 acres, adjoining the Kurtz-Chatterton, in the Encampment district.

HECLA & ARIZONA DEVELOPMENT CO. **ARIZONA.**

Title changed to Red Jacket & Bisbee Development Co.

HECLA & ARIZONA GOLD & COPPER MINING CO. **ARIZONA.**

Incorporated, 1902, by J. M. Carroll, of Weatherford, Texas, et al.

GEWERKSCHAFT HEDWIGSGLÜCK. **GERMANY.**

Mine office: Rheinbach, Kreis Bruhl-Unkel, Rheinland, Germany.

HELEN MINING CO. **NEW MEXICO.**

Mine office: Graham, Socorro Co., N. M. Thos. Graham, president. Ores carry gold, silver and copper. Has a 30-stamp mill, and is equipped with steam, water and electric power. Operates the Confidence group, employing about 75 men.

HELGA GOLD & COPPER CO. **BRITISH COLUMBIA.**

Mine office: Clayoquot, Vancouver Isld., B. C. Has expended about $25,000 on development, and is said to have a promising showing of ore.

HELSINGBORG'S KOPPERVERK. **SWEDEN.**

In Malmohus Län, Sweden. Made 647,884 kilograms of cement copper, averaging 75.5% fine, and 1,166 kilograms of silver precipitate, averaging 5.2% fine, in 1901.

HELVETIA COPPER CO. **ARIZONA.**

Office: 27 State St., Boston, Mass. Mine office: Helvetia, Pima Co., Ariz. Incorporated March. 3, 1899, under laws of New Jersey, with capitalization $5,000,000, shares $25 par; issued, $3,750,000. Annual meeting third Wednesday in February. Wm. A. Paine, president; Frederic Stanwood, vice-president; Fred B. Close, general manager; Old Colony Trust Co., of Boston, transfer agent. Lands, 55 patented claims, area 1,100 acres, also 900 acres miscellaneous lands, in the Santa Rita mountains, 35 miles southeast of Tucson. Formation greatly resembles that at Bisbee, the carboniferous limestone strata being of the same geological horizon, with similar porphyritic intrusions, but showing much stronger outcrops and gossans. The mine made an exceptionally fine showing from a depth of 35', but ores turned to sulphides on the third level, the base ores averaging under 5% copper. Main shaft is the Isle Royale, 400' deep, which should be sunk to depth of at least 1,000'. Mine has 1,940' of shafts, 15,868' of tunnels and drifts and 5,200' of open-cuts. Machinery includes gasoline hoists and one steam and one gasoline air compressor. Nearest railroad station is about 16 miles distant, at Vails, on the Southern Pacific. A 2¾-mile private railroad line connects the mine and smelter. First smelter was burned in 1900 and rebuilt in 1901, present plant having a daily capacity of 150 tons. Mine made about 1,000,000 lbs. of refined copper in 1901, largest production being at the rate of about 200,000 lbs. monthly. Has smelted 26,892 tons of ore, giving average returns of $14.47 per ton. The advisability of installing a leaching plant has been given consideration. Property is now in the hands of the Michigan & Arizona Development Co., on terms explained in description of that company.

HENRIETTA MINE. **ARIZONA.**

Mine office: Bigbug, Yavapai Co., Ariz. Barnes & Wilson, owners. Ores carry gold and copper. Has steam power and 10-stamp mill.

HENSON CREEK LEAD MINES CO. COLORADO.

Office: 15 Court St., Boston, Mass. Mine office: Lake City, Hinsdale Co., Colo. C. E. Whiting, president; P. T. Newitt, superintendent. Property includes the Bonanza, Magnolia and other mines, carrying ores of gold, silver, lead and copper. Has water and electric power and a 50-ton concentrator, employing about 40 men.

MINAS HERCULES Y OTRAS. CHILE.

Mine office: Taltal, Antofagasta, Chile. Henri Hintze, owner and manager. Are producers of gold and copper ore. Have steam power and 4 Chilean mills, employing about 100 men.

HERCULES CONSOLIDATED MINING CO. COLORADO.

Mine office: Silverton, San Juan Co., Colo. Thos. H. Kane, superintendent. Has a 40-stamp mill and mines cupriferous gold and silver ores.

HERCULES GOLD & COPPER CO. NORTH CAROLINA.

Office: 150 Nassau St., New York. Mine office; Cid, Davidson Co., N. C. Employs about 100 men. Organized May, 1901, under laws of South Dakota, with capitalization $1,000,000, shares $1 par. Wm. A. Anderson, president; H. L. Prentice, vice-president; R. E. Nuese, secretary; Saml. G. W. Brown, treasurer and general manager; Walter Cockreham, superintendent: John Jackson, mine superintendent. Lands, about 1,000 acres owned in fee and 1,300 acres held under contract, in Davidson county, showing 3 fissure veins ranging 18″ to 15′ in width, giving average assays of 7% copper, 2 oz. to 17 oz. silver and $1.50 to $15 gold per ton, from melaconite, bornite and chalcopyrite, mainly the latter. Is opened by shafts of 90′, 140′, 310′ and 510′ and by 4 tunnels, two of 100′ each, one of 1,500′ and one of 2,500′, estimated to give about 65,000 tons of ore blocked out for stoping. Has a 600-h. p. steam and electric plant, including 4 hoists good for depth of 1,000′ each, a 20-drill Clayton duplex air compressor, 16 power drills, etc. Buildings include a 30x40′ smithy, 60x80′ shafthouse, 16x24′ compressor house and 12 dwellings, with 40x64′ shafthouse building at the North shaft. Has a 10-stamp mill with 100 tons daily capacity and is erecting a 30x60′ concentrator, to be completed April, 1904. Has a smelter with 150-ton Allis-Chalmers water-jacket furnace, 1,000′ from the main shaft, fully equipped and to be blown in when the concentrator goes into commission. Nearest railway, 14 miles. Has on the dumps several thousand tons of high-grade ore extracted in development. For 1904 company plans beginning the production of both gold and silver, extension of underground workings and prospecting of sundry other properties of promise hitherto unopened. Company is well managed and its development has been along intelligent lines. Property is regarded as one of the most advanced and promising in the Appalachian field.

HERCULES MINING CO. WYOMING.

Office: 523 Bee Bldg., Omaha, Neb. Capitalization $1,000,000, shares $1 par. C. M. Jacques, president and general manager; J. E. Thatcher, secretary and treasurer. Lands, 4 claims, area about 80 acres, showing fissure veins, averaging 9′ wide and giving assay values of 5% to 49% copper from carbonate and sulphide ores. Main shaft, 280′, also a 90′ tunnel. Has steam and gasoline power. Idle at last accounts.

HERMINIA MINING CO. **ONTARIO.**

Property sold to Calumet & Algoma Development Co.

HERMIT LAKE COPPER CO. **COLORADO.**

Office: 31 Milk St., Boston, Mass. Mine office: Silver Cliff, Custer Co., Colo. Organized 1899, under laws of Maine, with capitalization $2,000,000, shares $20 par. John H. Norton, president; Oliver J. Kimball, secretary; W. S. Elmendorf, superintendent. Ores carry gold and copper. Has water power and 20-stamp mill, employing about 25 men.

MINA LAS HERRERIAS. **SPAIN.**

Operated by Bede Metal & Chemical Co.

HESPERUS GOLD & COPPER MINES CO. **BRITISH COLUMBIA.**

Mine office: Grand Forks, B. C. Chas. J. Magee, president; S. P. Brannan, secretary; T. H. Rae, managing director. Organized 1903, with capitalization $1,000,000, shares $1 par. Property is the Betts and Hesperus claims, on Hardy Mountain, about 4 miles from Grand Forks, developed by about 200′ of cross-cuts and shafts showing promising bodies of self-fluxing sulphide ore. Company contemplates shipping ore to the Granby smelter in 1904.

HETTA MOUNTAIN GROUP. **ALASKA.**

Eight claims near Copper Harbor, Prince of Wales Island, Alaska, in north latitude 59°. Is asserted that property has a vein 2′ to 20′ wide and 3,000′ long, averaging 10% copper, $2 gold and 3 oz. silver per ton.

HETTIE GREEN GROUP. **BRITISH COLUMBIA.**

Office and mine: care of James Thompson, owner, Alberni, B. C. Lands, on Tranquil Creek, Bear River district, Clayoquot division, have had considerable development work and give a fair showing of chalcopyrite, with occasional bornite.

HIBBE GOLD & COPPER MINING CO. **CALIFORNIA.**

Office: Sheridan, Cal. Organized 1903, with capitalization $75,000, to operate in Hibbe county, California. N. H. Kaichner, president; Geo. Grutman, secretary and treasurer.

HIBIRA MINE. **JAPAN.**

Mine office: Kitakata-mura, Higashi-Usuki-gori, Hyuga, Japan. An ancient mine carrying chalcopyrite associated with iron pyrites, averaging 5% to 6% copper, in lenses lying in clay-slate and sandstone. Is a producer of importance, output for 1900 having been 1,769,498 lbs. refined copper.

J. F. HICKS & CO. **TENNESSEE.**

Mine office: Bristol, Sullivan Co., Tenn. Have copper claims, slightly developed and supposed to be idle.

HIDALGO MINING CO. **MEXICO.**

Office: Douglas, Ariz. Mine office: Nacosari, Sonora, Mexico. S. F. Maguire, president; E. R. Pirtle, secretary; Jas. I. Long, general manager. Lands, 3 groups of 80 pertenencias, area about 200 acres, 6 miles west of the properties of the Moctezuma Copper Co., showing large outcrops of ore carrying copper, silver, lead and gold, giving assays of 15% to 30% copper and $2.50 to $8 gold per ton. A second group 2 miles southward gives assays of 11% copper, $2 gold and 200 oz. silver per ton, from a vein of 11′ to 15′. Property has been examined and reported upon favorably by Frank Klepetko and other mining engineers of standing. Said to be under bond to Jos. Leiter of Chicago. This is a property of much more than average promise.

HIDDEN TREASURE GROUP. CELIFORNIA.

Office and mine: care of Alger Bros., owners, Callahan, Siskiyou Co., Cal. Has a 100′ tunnel on an 8′ vein of disseminated ore with quartz gangue.

HIDDEN TREASURE MINING & MILLING CO. WASHINGTON.

Office: 27 Pacific Blk., Seattle, Wash. Mine office: Methow, Okanogan Co., Wash. Joseph West, treasurer and general manager. Organized 1896. Has a fissure vein of 2′ to 4′ width, with ore chutes of 8′ to 10′ width, traversing gneiss and carrying auriferous and argentiferous galena, sphalerite and chalcopyrite, with quartz and calcite gangue. Smelter shipment of 90 tons gave returns of $67 per ton.

HIDDEN TREASURE MINING & TUNNELSITE CO. WYOMING.

Office: Lincoln, Neb. Mine office: Battle Carbon, Co., Wyo. H. M. Rice, manager. Has auriferous and argentiferous copper ores, opened by a long tunnel. Has water power and employs 10 to 15 men.

HIGASHIYAMA MINE. JAPAN.

Mine office: Higashiyama-mura, Oe-gori, Awa, Japan. Ore is chalcopyrite, associated with iron pyrites, occuring in lenses lying in quartz schist, and averaging 2% to 2.5% copper. Production in 1898 was 104,424 lbs. refined copper.

HIGGINS DEVELOPMENT CO. ARIZONA.

Office: 402 Equitable Bldg., Chicago, Ill. Mine office: Bisbee, Cochise Co., Ariz. Organized May 14, 1903, under laws of Arizona, with capitalization $500,000, shares $10 par. Nathan F. Leopold, president; J. H. Rice, vice-president; A. F. Leopold, secretary; Jas. R. Dee, treasurer; Scott Turner, superintendent. Property is the Higgins group of 11 claims, lying immediately northwest of the original openings of the Copper Queen mine, in Tombstone Canyon, Bisbee. Property is held under bond and lease of $675,000, on which the first payment of $100,000 was made in May, 1903. Stock was issued $5 paid, and a $1 assessment, payable 50c. November 25, 1903, and 50c. January 25, 1904, has since been levied. Development is by shaft and two tunnels. Shaft, which is full working size, has 3 compartments and is 320′ deep and very wet. A drift is being run toward the Copper Queen on the 300′ level. The lower tunnel, 12′ above the collar of the shaft, is 700′ long and shows considerable hematite, with copper stains. The upper tunnel, 237′ above the collar of the shaft, is 300′ long, showing at a distance of 150′ a convergence of several small fissure veins, with a narrow cave showing good copper values. A winze is being sunk from the upper tunnel to connect with the lower. Machinery includes a 10x14″ duplex hoist, good for 2,000′ depth, and a 6-drill air compressor.

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F. C. HILLS & CO. **SPAIN.**

An English corporation operating the Castillo del Buitron mine.

HILLSIDE COPPER MINING CO. **NEVADA.**

Office: 201 Exchange Bldg., Denver, Colo. Mine office: Pioche, Lincoln Co., Nev. Organized under laws of Nevada with capitalization $2,000,000, shares $1 par. Wm. Gelder, president; M. E. Buffington, secretary; J. E. Gelder, treasurer. Employed 40 men in 1901, but was idle at last accounts.

HIMALAYA MINING CORPORATION, LTD. **INDIA.**

Offices: Lenox House, Howard St., London, W. C., Eng. Sir W. H. D'Oyley, chairman. Registered March 7, 1902, with capital, nominal, £30,000, to acquire the Rai copper mine, Kumaon Division, Northwest India.

HIRAKANE MINES. **JAPAN.**

Mine office: Nibukawa, Rikuchu, Japan. T. Tokoyama, owner; S. Tsubouchi, superintendent. Ores carry silver and copper. Mines have steam and electric power, and smelter. Employ about 500 men.

HISAMUNE MINE. **JAPAN.**

Mine office: Kawada, Oe-gori, Awa, Japan. A comparatively new property. Ore is chalcopyrite, slightly argentiferous, and averaging 4% copper, occurring embedded in clay-amphibolite, beds ranging 2′ to 5′ in thickness. Output in 1899 was 112,196 lbs. refined copper.

HISANICHI MINE. **JAPAN.**

Mine office: Nakagawa-mura, Senhoku-gori, Ugo, Japan. Ore is chalcopyrite, associated with sphalerite and iron pyrites, all slightly argentiferous, in a vein in augite-andesite. Production for 1900 was 134,074 momme of silver and 566,268 lbs. refined copper.

HODGES HILL MINE. **NORTH CAROLINA.**

An old and idle property in Guilford Co., N. C. Ore is chalcopyrite with quartz gangue, in vein of 6′ to 12′ width.

HOFMAN CLAIMS. **CALIFORNIA.**

Four claims, area 80 acres, near Ukiah, Lake Co., Cal., giving assays of 6% copper, $5 gold and 2 oz. silver per ton, from carbonate and sulphide ores.

HOFRET EL NAHAS MINE. **SUDAN.**

In Southwest Kordofan, Anglo-Egyptian Sudan. Is worked in a small way to meet purely local demands, ores being smelted in a primitive manner at the mines.

HOGASHO MINE. **JAPAN.**

Mine office: Hatayama-mura, Aki-gori, Tosa, Japan. Ore is chalcopyrite, mixed with iron pyrites, averaging about 7% copper, occurring in lenses in country rocks of shale and sandstone, with intercalated red and and green schalkstein. Production in 1900 was 138,032 lbs. refined copper.

HOKOISHI MINE. **JAPAN.**

Mine office: Kamo-mura, Nii-gori, Iyo, Japan. Ore is chalcopyrite mixed with iron pyrites, carrying 3.5% to 4% copper, in narrow veins averaging 1′ width, occurring in chlorite-amphibolite. Production for 1900 was 52,373 lbs. refined copper.

HOLDEN MINING CO. **WASHINGTON.**

Mine office: Chelan, Chelan Co., Wash. Lands, 3 claims, area 60 acres, opened by 3 tunnels, longest 500′, showing a vein of 40′ to 54′ width, carrying low-grade auriferous copper ores. Company plans installation of a 10-drill compressor and an aerial tram in spring of 1904, and is said to have contracted with the Chelan Transportation & Smelting Co. for a considerable ore production, at rate of 200 tons daily.

HOLDEN EXTENSION GOLD & COPPER MINING CO. **WASHINGTON.**

Mine office: Chelan, Chelan Co., Wash. W. J. Bowen, secretary and general manager. Capitalization, $1,500,000. Lands, 2 claims on the Holden lode, near Chelan.

acres. Development is by tunnels of 125′ and 250′. Property is in the Solomon Springs district, about 5 miles southeast of Bisbee. The surface showing, as is the case nearly everywhere in the Warren district, gives but small outcrops of ore, but geological conditions are favorable to the existence of large and profitable ore bodies at depth.

HOULIHAN GOLD & COPPER MINING CO. ARIZONA.

Mine office: Jerome Junction, Yavapai Co., Ariz. J. T. Whedon, president; Geo. Houlihan, vice president; Geo. C. West, secretary and treasurer. Has a 100′ shaft, said to cut a 35′ vein.

HOWARD COPPER CO. MONTANA.

Mine office: Phillipsburg, Granite Co., Mont. Letter returned unclaimed from former office, 618 Broadway, New York. Organized under laws of South Dakota, with capitalization $1,500,000, shares $1 par. Lyman N. Loomis, of Butte, Montana, president and treasurer. Lands, 60 acres, on which a little development work has been done. Title supposed to have been lost. President said to be an honest man, but company was promoted by Ralph M. Jacoby.

HOWARD MINING CO. VIRGINIA.

Mine office: Virgilina, Halifax Co., Va. C. N. Howard, general manager. Property is the Chappel mine, 10 miles from Virgilina and adjoining the High Hill mine of the Virginia Copper Co. on the northeast, also a gold property about 4½ miles north of Virgilina. Only surface prospecting was in progress at close of 1903.

HOWELL MINES. AUSTRALIA.

Mine office: Howell, N.S.W., Australia. John Howell, manager. Property includes the Conrad mine, with a 250′ main shaft, showing a good ore body assaying 3% copper and 2 dwts. gold, with good tin values. Erection of smelter is contemplated.

HOWLE COPPER MINES. ARIZONA.

Mine office: Globe, Gila Co., Ariz.

HUACHUCA CONSOLIDATED MINING CO. ARIZONA.

Office: Bisbee, Cochise Co., Ariz. J. S. Parmerlee, general manager. Jas. G. Correa, secretary. Capitalization $1,250,000, shares $5 par. Lands, 22 claims, area 440 acres, in the Huachuca Mountains, about 25 miles west of Bisbee, opened by 2 tunnels and a 200′ shaft, showing ore assaying 3% copper and $28 gold per ton, with about 1,500 tons of ore of this grade on the dumps.

COMPANIA HUANCHACA DE BOLIVIA. BOLIVIA.

Offices: Rue du General Foy, 46, Paris, France. Mine office: Pulacayo, Bolivia, via Antofagasta, Chile. P. Villamil, agent. Operates La Playa Blanca mine, opened, 1892. Production, 1,500 to 2,000 tons refined copper yearly.

HUDSON MINE. COLORADO.

Mine office: Granite, Chaffee Co., Colo. W. H. Ball, superintendent. Ores carry gold, silver and copper. Was developing on a small scale at last accounts.

HUELVA COPPER & SILVER MINES, LTD. SPAIN.

Registered Oct. 28, 1903, by Denton, Hall & Burgin, 15, Gray's Inn

Square, London, W. C., England, with capitalization £300,000, to acquire mines and mineral rights in Spain or elsewhere.

COMPAGNIE DES MINES DE CUIVRE DE HUELVA. **SPAIN.**

Offices: Brussels, Belgium. Mine office: La Granada, Huelva, Spain. Property includes the Numancia, Sagunto and Tarro mines, in process of development.

SOCIEDAD PYRITES DE HUELVA. **SPAIN.**

Mine office: Calañas, Huelva, Spain. Has mining lands in process of exploration and development.

HUELVA CENTRAL COPPER MINING CO., LTD. **SPAIN.**

Is in hands of a receiver, F. Belcher, 39, Coleman St., London, E. C., Eng. Property, at Almonaster, Huelva, Spain, area 4,000 acres, includes the Cueva de la More mine, recently reopened.

HUERFANO GOLD & COPPER MINING CO. **COLORADO.**

Organized under laws of Kentucky to develop prospects near Ojo, in the Sierra Blanca district of Huerfano county, Colorado.

HUESCA COPPER, IRON & LEAD MINES, LTD. **SPAIN.**

Offices: 49, Queen Victoria St., London, E. C., Eng. S. D. Cropper, secretary. Capital, nominal, £50,000. Cannot be learned that company is operating or owns any mining land.

COMPANIA MINERA DE HUIRIACHIC. **MEXICO.**

Mine office: Chalchihuites, Zacatecas, Mexico. John Stenner, president; C. A. Phelps, treasurer and general manager. Has argentiferous and auriferous chalcopyrite and galena, opened by shaft and tunnel, and employs about 75 men.

HUMBER CONSOLIDATED MINING & MANUFACTURING CO. **NEWFOUNDLAND.**

Mine office: Birchy Cave, Bay of Islands, Nfld. H. F. Smythe, manager. Organized 1902, under laws of New Jersey, to take over the property formerly operated by the York Harbour Copper Co., that company being in litigation. Property is said to be developing well and it is planned to begin ore shipments to American works in May or June, 1904.

HUMBOLDT MINE. **NEW MEXICO.**

Mine office: care of Schlosser & La France, owners, Fierro, Grant Co., New Mexico.

HUMBOLDT COPPER CO. **MICHIGAN.**

Office: 50 State St., Boston, Mass. Organized 1863, under laws of Michigan, with capitalization $1,000,000, shares $25 par. William F. Fitzgerald, president; John Brooks, secretary and treasurer. Lands are about midway between Arnold and Phoenix mines, in Keweenaw Co., Mich. Has one shaft of 300′ on the Arnold ashbed. Was opened 1853, and last exploratory work was done in 1901. Was never a producer. About $125,000 has been expended on the property.

HUMBUG MINING CO. **UTAH.**

Mine office: Eureka, Juab Co., Utah. J. W. Roundy, superintendent. Ores carry gold, silver and copper. Has steam power and employs about 50 men.

HUMMER GROUP. **CALIFORNI**

Office: care of Mischler & Rollins, owners, Callahan, Siskiyou Co., C Ore occurs as irregular bodies of slightly nickeliferous chalcopyrite, di seminated in pyrrhotite.

HUNT MINING & MILLING CO. **IDAHO**

Office: 8 India St., Boston Mass. Mine office: Weiser, Washingto Co., Idaho. Idle.

HUNTER CREEK MINING & MILLING CO.

Alleged by shareholders to be a fraud.

HURON MINING CO. **WASHINGTON.**

Mine office: Darrington, Snohomish Co., Wash. L. H. Sawyer, superintendent. Has auriferous copper ores and water power.

HUSSLEMAN & SHAW GROUP. **CALIFORNIA.**

A group of 31 claims in the Moonlight Creek district, Lights Cañon, Plumas Co., Cal. Was developing by tunnel at last accounts.

HUSTON MINE. **ONTARIO.**

Owned by J. J. Case, Dollar Bay, Mich., and 16 others. Lands, 1,400 acres, at Montgomery, 15 miles north of Thessalon, Algoma, Ont. Vein, 60′ between walls, with 18′ of payable ore, assaying 8%, traced 3,000′. Vein stands up as a 40′ bluff, and can be best developed by tunnels. Ore has quartz gangue, and can be concentrated to 20% copper or better. Property lacks rail transportation, and is undeveloped.

HYCO MINE. **VIRGINIA.**

An idle property north of Virgilina, Halifax Co., Va. Fully described in Vol. II.

HYPOCKA MINING CO. **MONTANA.**

Mine office: Butte, Silver Bow Co., Mont. Organized 1902, with capitalization $1,000,000, as a subsidiary corporation of the United Copper Co. Property is an undivided fifth interest in the Minnie Healey mine, other four-fifths of which are in litigation.

IBARRA HERMANOS. **SPAIN.**

Offices: Sevilla, Spain. Mine office: Cortegana, Huelva, Spain. Supposed to be operating on a small scale.

ICONOCLAST CONSOLIDATED MINES CO. **WASHINGTON.**

Office: 412 Berlin Bldg., Tacoma, Wash. Mine office: Keller, Ferry Co., Wash. Is a consolidation of the Alliance Copper Mining Co. and the Iconoclast Gold & Copper Mining Co. Organized 1902, under laws of Washington, with capitalization $2,500,000, shares $1 par. J. R. Turner, president; C. E. Peterson, secretary; Alex. McMasters, superintendent; Robt. Young, engineer. Lands, 7 claims, area 115 acres, showing 3 contact veins, one stated by company to be 150′ wide and assaying 5% copper, 2 oz. silver and $5 gold per ton from chalcopyrite. Main shaft, 325′; also 3 tunnels with aggregate length of 514′. Has gasoline power.

ICONOCLAST GOLD & COPPER MINING CO. **WASHINGTON**

Absorbed by Iconoclast Consolidated Mines Co.

SOLIDATED COPPER MINES CO.
eturned unclaimed from former office, 17 Park Row Bldg.,
Mine office: Decorah, Washington Co., Idaho. Supposed also
ral holdings in vicinity of Wickenburg, Maricopa county, Arizona.
99, under laws of West Virginia, with capitalization $1,000,000,
ır. C. F. Hathaway, president; J. M. Archer, secretary.

' CESSION. **BULGARIA.**
are of M. Dimitri Ikonomoff, owner, Hotel Boulevard, Sofia,
line office: Kara-Bair, Bourgos, Bulgaria. Property is held
from the principality, and is in the development stage.

)PPER MINING CO. **WYOMING.**
62 Monadnock Blk., Chicago, Ill. Mine office: Encampment,
Wyo. Organized 1899, under laws of Wyoming, with capitali-
),000, shares $1 par. Geo. H. Miller, president and general man-
. Mallory, secretary and treasurer; Thos. R. Smith, superintend-
9 claims, area 185 acres, in the Upper Platte district of Carbon
ing 3 contact veins, principal vein being 18′ wide, 50′ deep and
carrying chalcocite in quartz gangue and assaying 14% to 27%
ld and 20 oz. silver per ton. Has 3 shafts, deepest 70′. Has a
high-grade sulphide ore, and property gives promise of making
well developed.

OLD & COPPER MINING CO. **MEXICO.**
eturned unclaimed from former mine office, Panuco, Coahuila,
operty was Los Caballos mine, carrying ores of copper, gold and

USION. **MEXICO.**
are of Dr. Augustin P. Gavilan, owner and manager, 4A, Calle
cisco, Durango, Mex. Mine office: Gabriel, Durango, Mex. Is
f gold, silver, lead, copper, zinc and mercury. Mine is opened
nd employs about 40 men.

LIDATED MINING & MILLING CO. **IDAHO.**
ice: Pattison, Idaho. Ores carry silver, gold and copper. Has
and 100-ton concentrator, employing about 60 men.

COPPER CO. **ARIZONA.**
care of Development Company of America, 11 Pine St., New
ombstone, Ariz. Mine office: Red Rock, Pinal Co., Ariz. Em-
en. Organized May, 1903, under laws of Arizona, with capitali-
0,000, shares $10 par, company being financed by the Develop-
ny of America. E. B. Gage, president; W. F. Staunton, vice-
d general manager; Geo. A. Beaton, secretary and treasurer;
n, assistant secretary and treasurer; Perry Williams, superin-
ands, 50 claims, area 800 acres, also 3 square miles of miscellan-
giving total holdings of 2,720 acres, in the Silver Belt district of
, Arizona. Country rocks are altered granite and limestone, ore
ring along a fissured contact zone 300′ in width, this having a
y strike. Ores are carbonate at surface, with bornite and chal-

copyrite at depth, giving average assays of 13% copper and 3 oz. silver per ton, with traces of gold. Development is by 2 shafts, the Union being 200′ deep and the Mammoth 300′. There are also a number of unused shafts and pits and the property has about 10,000′ of underground openings, developing about 100,000 tons of ore blocked out for stoping. The property was discovered previous to 1880 and suffered many vicissitudes of fortune previous to passing into present hands. Has a 150-h. p. plant, with 3 hoists good for depth of 1,000′ and a 10-drill compound Norwalk air compressor, driven by gasoline, with engine house, boilerhouse and shops. There is also an old 100-ton matting smelter, 1¼ miles from the mine, which probably will not be used at all by the present company, as it is small and ancient in equipment. For 1904 the company plans sinking 2 shafts to depth of 1,000′ each and developing the extensive ore bodies along systematic lines. A 19-mile railroad will be built to connect with the Southern Pacific at Red Rock, and a smelter, probably of about 500 tons daily capacity, is to be built at the latter point. The personnel and management of the Imperial Copper Co. is the same as that of the Tombstone Consolidated Company, which is reviving the old silver camp of Tombstone. The company is strong financially and has a highly energetic management. Several years will be required to complete the work now planned, but at the end of that time the Imperial should be in a position to produce nearly or quite 2,000,000 lbs. of refined copper monthly.

IMPERIAL COPPER CO. **ONTARIO.**

Organized at Duluth, Minnesota, in November, 1899, to exploit bornite ore deposits in the Parry Sound district of Ontario. Letter returned unclaimed from Duluth.

IMPERIAL COPPER & GOLD MINING CO. **WYOMING.**

Mine office: Encampment, Carbon Co., Wyo. M. F. Whalen, superintendent, at last accounts.

IMPERIAL COPPER MINING CO. **CALIFORNIA.**

Owns the Painter mine, near Pollasky, Fresno Co., Cal. Vein is 4′ to 7′ wide, traversing diabase and amphibolite schist, and showing oxidized ores averaging 15% copper, in gangue of talcose schist. Has 3 shafts, deepest 110′. Idle at last accounts.

IMPERIAL COPPER MINING CO. **UTAH.**

Office: 205 La Salle St. Chicago, Ill. Mine office: Frisco, Beaver Co., Utah. Capitalization $6,000,000, shares, $10 par. A. B. Lewis, president and general manager; C. F. Haynes, secretary and treasurer; Frank X. Pellier, superintendent. Lands are about 400 acres, including the Comet and other groups, in the neighborhood of the Horn Silver and Majestic mines. Ores carry copper, gold and silver. Is developed by tunnels. Has carbonate ores above, and sulphides below, which have given assays of 15% lead, 30% copper, 18 oz. silver and $1 to $9 gold per ton. Property is well located, under good management, and regarded as valuable.

IMPERIAL MINING CO. **WASHINGTON.**

Mine office: Silverton, Snohomish Co., Wash. Jas. E. Dupree, president;

Marysville, Wash.; M. Swinnerton, superintendent. Lands, 11 claims, showing a contact vein between diorite and conglomerate, ores carrying gold, silver, copper and lead.

IMPERIAL PAINT & COPPER CO. **CALIFORNIA.**

Mine office: Spenceville, Nevada Co., Cal. Otto Woehler, superintendent. Has steam power. Mine is developed by an open cut.

IMPERIAL-MONTANA COPPER MINING, SMELTING & WATER POWER CO. **MONTANA.**

Offices: 271 Broadway, New York, and Helena, Mont. Mine office: Blackfoot, Teton Co., Mont. Organized 1901, under laws of Arizona, with capitalization $10,000,000, shares $10 par. J. H. Calderhead, vice-president; Oliver M. Holmes, treasurer; J. B. Holmes, superintendent. Lands, 9 claims, area about 180 acres, on which more or less development work has been done. Company was in financial straits at last accounts.

INCA MINING & MILLING CO. **IDAHO.**

Office: Colfax, Washington Co., Idaho. Mine office: Cuprum, Washington Co., Idaho. Employs 10 to 15 men. M. O. Reid, superintendent. Property is the Mineral World mine, carrying auriferous and cupriferous silver-lead ores.

INDEPENDENCE MINE. **MONTANA.**

An idle property on the Tobacco Plains, near Kalispell, Flathead Co., Montana. Vein said to be 25′ wide, showing 8% copper, and $4 to $10 gold and silver per ton.

INDEPENDENCE MINING CO. **COLORADO.**

Mine office: Turret, Chaffee Co., Colo. Ores carry copper and gold. Has steam power and employs about 15 men.

INDEPENDENCIA MINING CO. **MEXICO.**

Office: St. Paul, Minn. Mine office: Ameca, Jalisco, Mex. C. D. O'Brien, manager. Mine is opened by 300′ shaft and 375′ tunnel, is producing copper and silver and employs about 60 men.

INDEPENDENT MINING CO. **WASHINGTON.**

Mine office: Baring, King Co., Wash. Benj. Evans, superintendent.

INDEX MINING CO. **WASHINGTON.**

Mine office: Index, Snohomish Co., Wash. Lot Wilbur, president and general manager, Snohomish, Wash. Lands, 5 claims, showing 3 veins, one averaging 3′, with paystreak on foot-wall carrying bornite and chalcocite, and giving increased values at depth.

INDEX-BORNITE COPPER MINING CO. **WASHINGTON.**

Office: 36 Dexter Horton Bldg., Seattle, Wash. Mine office: Index, Snohomish Co., Wash. Employs about 12 men. A. M. Watt, secretary and treasurer. Lands, about 3 miles from Index, show a 2′ vein carrying bornite giving assays of 16% to 50% copper and 6 oz. to 8 oz. silver per ton.

INDEX-HORSESHOE COPPER MINES. **WASHINGTON.**

Office: care of F. Danel, 217 Columbia St., Seattle, Wash. Mine office: Index, Snohomish Co., Wash. A small prospect, now idle.

INDEX-INDEPENDENT MINING CO. **WASHINGTON.**

Mine office: Index, Snohomish Co., Wash. Benj. Evans, superintendent. Lands, 3 claims, 5 miles southeast of Index, with about 1,000′ of openings on a vein standing nearly vertically and traversing granite, carrying chalcopyrite, chalcocite and bornite, with quartz gangue. A carload of ore shipped assayed $98.98 per ton.

INDEX-PEACOCK COPPER MINES. **WASHINGTON.**

Office: care of F. Danel, 217 Columbia St., Seattle, Wash. Mine office: Index, Snohomish Co., Wash. A prospect on which a limited amount of development work has been done.

INDIANA MINE. **MICHIGAN.**

A tract of 1,280 acres in Sections 21, 27 and 28, Town 51 North, Range 37 West, Ontonagon Co., Mich. Has 2 shafts, each of 180′ depth. Owners spent $200,000, circa 1862-1865. Idle many years.

INDIANA COPPER CO. **WYOMING.**

Supposed to hold 6 claims near the Rambler mine, at Holmes, Albany county, Wyoming.

INDIANA-SONORA COPPER & MINING CO. **MEXICO.**

Property is the Sierra de Cobre mine, surrounded by holdings of the Greene Consolidated, at La Cananea, Sonora, Mexico. Option expiring June, 1904, is held on a percentage of stock by Phelps, Dodge & Co. Property is described under name of Sierra de Cobre mine.

INDIANAPOLIS COPPER MINING CO. **WYOMING.**

Mine office: Riverside, Carbon Co., Wyo. Lands, 14 claims, 6 miles southeast of Riverside. Has steam power.

COMPANIA INGLESA DE MINAS. **CHILE.**

Mine office: Puquios, Copiapo, Atacama, Chile.

COMPAGNIE D'INGUARAN. **MEXICO.**

Office: Paris, France. Mine office: Inguaran, Mochoacan, Mex. J. L. Phillips, director. Company is a close corporation, controlled by the French house of Rothschild, and gives out no information. Employs about 300 men. Lands, 185 pertenencias, area 457 acres of patented lands, and 5,000 pertenencias held under concession, in the Tacambara district. Price paid for undeveloped property was $1,500,000, Mexican. Country rock is granite in several stages of alteration, capped by a silicious limestone of 200′ to 300′ thickness. Ores of the district range 1.5% to 65% copper with 2 oz. to 100 oz. silver and from a trace up to 1 oz. gold per ton. Ores of the Inguaran are almost exclusively sulphide, the ore body, of immense size, carrying mainly disseminated chalcocite, associated with a little bornite and chalcopyrite, with granite-porphyry gangue, gold values being slight, but silver values considerable. Estimates of size and value of ore bodies vary greatly, but the best authorities give an estimated average value of 3.25% copper, with about 3,000,000 tons developed. The proven depth of the ore is about 300 metres, at which depth the ore body apparently cuts off. The ore is well suited for concentration, and it is planned to put about 8 or 10 tons into 1, before smelting. The mine is opened by a 2,500′ tunnel and 2 main shafts, deepest 350′, levels being opened every 80′. Both ore and country rock are exceedingly firm and the mine will require no timbering.

The Inguaran has steam power, but is developing about 200 h. p. at Mata de Plantano, 6½ miles from the mine, from a stream with an available head of 930′, flowing about 80 liters per second and fed by springs that burst forth from the foot of Mt. Jorullo, about 150 years ago, after the last eruption of that volcano.

Nearest railroad is the Mexican National, about 75 kilometres distant. The company plans building a railroad line of several hundred miles from the mines to Zihuatanejo, on the Pacific south of Acapulco. The route of the proposed railroad traverses an exceedingly rugged country, and the line cannot be completed before 1906 or 1907, if it be built at all.

Owing to its inaccessibility and the fact that the property is controlled by the Rothschilds, many misleading stories have been printed regarding the Inguaran, and the popularly accepted estimates of its richness, size and productive capacity are grossly exaggerated. The mine has a large body of low-grade ore and will probably make a considerable producer in time, but the quantity and quality of its ore are not equal to ores possessed by a number of other copper mines in Mexico. Development is proceeding very slowly and it will be several years before the Inguaran is a producer.

INTERCOLONIAL COPPER CO. **NEW BRUNSWICK.**

Office: 702 Banigan Bldg., Providence, R. I. Mine office: Dorchester, Westmoreland Co., N. B. Organized 1899, under laws of Arizona, with capitalization $2,500,000, shares $10 par. Darius L. Goff, president; T. J. Edwards, secretary; Allan W. Chapman, general superintendent; Henry Carmichael, consulting engineer. Lands, 250 acres freehold and 1,100 acres leasehold from the crown. A blanket vein carrying carbonate and sulphide ores is said to give returns of 3% to 4% copper. Has shafts of 40′, 75′, and 150′, also a 1,500′ drainage tunnel, with about 8,000′ of underground openings. Has steam and electric power. The reduction plant includes a 200-ton concentrator, leaching plant and electrolytic refinery. Equipment includes 2 boilers, 4 engines, crusher, rolls, 15 tubular roasting furnaces, six 300-ton leaching vats and two 50-kw. dynamos. The electrolytic plant has 550 lead cathodes and 550 lead anodes 22x33″ each, giving a plating surface of 5,000 square feet, for the deposition of electrolytic copper. Plant also includes tanks for precipitation of metal in cuprous leachings on scrap iron. The reduction plant did not prove satisfactory, machinery going wrong after the production of about 50 tons of refined copper. Property was idle at last accounts, lacking working capital.

INTERMOUNTAIN GOLD & COPPER MINING CO. **IDAHO.**

Mine office: Pocatello, Bannack Co., Idaho. G. B. Rogers, president; rank Ball, treasurer; G. A. Clark, secretary. Owns the Lost Horse group f claims on Ft. Hall Indian reservation, and has a 50′ shaft bottomed in ood ore.

ITERNATIONAL COPPER CO. **COLOMBIA.**

Office: 71 Broadway, New York, N. Y. Mine office: Natagaima, Tolima, Colombia. Organized October, 1900, under Arizona laws, with capitalization $1,000,000, shares $1 par. Wm. R. Townsend, president; Arthur F. Carmody, vice president; Wm. H. Martin, secretary and treasurer. Lands, 2,300 acres, near Natagamia, said to carry a good showing of copper, but only at present in a prospecting stage.

INTERNATIONAL COPPER & GOLD CO. **COLORADO, MONTANA, & MEXICO.**

Office: 1122–135 Adams St., Chicago, Ill. Employs 60 men. Organized 1899, under laws of Arizona, with capitalization $3,000,000, shares $1 par. Albert G. Beaunisne, president; A. B. Ballou, secretary and treasurer; W. C. Hermbuecher, general manager; Gad Freeman, superintendent. Lands, 149 claims, area about 400 acres, in Routt Co., Colorado; Madison and Missoula counties, Montana, and states of Sonora and Sinaloa, Mexico. Has shaft of 280′ in Montana, and 60′ shaft in Colorado. Ores are sulphide in Colorado, carbonate in Montana, and carbonate and oxide in Mexico.

Mexican properties include La Josefita group, 50 pertenencias, in Sonora, near the Sinaloa line, said to show an 80′ ore body giving assays of 25% to 28% copper, with good surface showing. Is planned to develop this group by quarrying. La Australia group of 20 claims, near El Fuerte, Sinaloa, is opened by a 70′ two-compartment shaft showing a 1′ pay-streak of bonanza ore, assaying 15% copper and 1,212 oz. silver per ton. La Sorteo group, 10 pertenencias, 7 miles from San Bernardo, has a 30′ vein opened by a 150′ tunnel, giving good assay values in gold, silver and copper. El Negro group, 14 pertenencias, carries gold and silver. The Piedregal group, 15 pertenencias, is a little east of El Negro. La Higuera group, 8 pertenencias, in Sonora, shows a 16″ pay-streak, in a 50′ vein, carrying mainly silver values. El Nino group, 10 pertenencias, 30 miles southwest of San Bernardo, gives good assay values in gold, silver and lead. The Zacatecas group of 10 pertenencias, carries gold.

Title to the Montana property is now in the Montana Copper & Gold Mining Co., stock of which is controlled by the International Copper & Gold Co. The Escalanta group, in Routt county, Colorado, is undeveloped.

INTERNATIONAL COPPER MINING CO. **ARIZONA.**

Office: P. O. Box, 530, Hancock, Mich. Mine office: Bisbee, Cochise Co., Ariz. Organized May 18, 1903, under laws of Arizona, with capitalization $3,000,000, shares $10 par. Fred J. Bawden, president; Jas. R. Cooper, vice-president; R. Mount Beattie, secretary; Geo. H. Nichols, treasurer; Carl Clausen, general manager. Lands, 14 patented claims near Solomon Springs, 6 miles southeast of Bisbee, in the Warren district.

INTERNATIONAL COPPER MINING & MILLING CO. **WYOMING.**

Office: care of F. M. Dunn, Minneapolis, Minn. Mine office: Encampment, Carbon Co., Wyo.

INTERNATIONAL GOLD & COPPER MINING CO.

Office: 62 Commercial Blk., Salt Lake City, Utah.

INTERNATIONAL GOLD-COPPER MINING CO. **BRITISH COLUMBIA.**

Company lost property at Rossland B. C., and stock is worthless.

INTERNATIONAL MINING CO. COLORADO.

Mine office: Black Hawk, Gilpin Co., Colo. Geo. F. Johnstone, manager. Ores carry gold, silver and copper. Has steam power and employs a small force.

INTERNATIONAL MINING CO., LTD. ONTARIO.

Office: care of V. E. Metzger, secretary and treasurer, Sault St. Marie, Mich. C. S. Beadle, general manager. Lands, 1,400 acres, known as the Brady location, lying east of the Mississagua River in Patton and Thompson townships, 30 miles east of Sault Ste Marie and 5 miles from Dean Lake station, Algoma, Ontario, opened by 12 test pits, deepest 24′, showing a 3′ vein carrying chalcopyrite assaying 5% to 28% copper, with small gold and silver values.

INTERNATIONAL MINING & REFINING CO. CHILE.

Mine office: Chañaral, Atacama, Chile. Operates a group of old mines at Chañaral, and is also opening mines in the Huantajaya district.

INTERNATIONAL NICKEL CO.

Office: 24 Broadway, New York. Ambrose Monnell, president; Col. R. M. Thompson, chairman; Joseph Claudet, secretary; Stephen H. B. Bell, treasurer. Is a securities holding corporation only, and is commonly known as the Nickel Trust. Organized March, 1902, under laws of New Jersey, with authorized capitalization of $24,000,000, half in 6% non-cumulative preferred and half in common stock, with an authorized bond issue of $10,000,000 of 30-year 5% bonds; outstanding $8,741,506 in preferred and same amount in common stock, also $9,903,441 of bonds. Capitalization is excessive and the stock much watered, but holdings are valuable, these including controlling interests of practically the entire stock issues of the Canadian Copper Co., Vermilion Mining Co., Orford Copper Co., American Nickel Works, at Camden, N. J., Nickel Corporation, Ltd., Société Miniere Calidonienne, also extensive stock interests in the Société le Nickel and sundry minor properties. Is said also to have bought the old Bruce mines, on Georgian Bay, Ontario, in 1903, to secure a supply of chalcopyrite suited for fluxing the refractory nickel-copper ores of the Sudbury district. For the first fiscal year, ending March 31, 1903, the company showed surplus earnings of about $559,000.

IOWA-NEW MEXICO MINING CO. NEW MEXICO.

Supposed to have copper-gold claims on Turkey Creek, also at Scheherville, N. M., but letters returned unclaimed from both points.

IRIGOYEN HERMANOS Y CA. MEXICO.

Mine office: Huetamo, Michoacan, Mex. Produced 48.9 metric tons of copper in 1902.

IRON CLAD COPPER MINING CO. OREGON.

Office: care of Dr. P. L. Mackenzie, Portland, Ore. W. H. Warren, secretary. Has 10 claims in St. Helen's district of Washington, on which 2 veins, giving average assay values of about $25 per ton in copper, gold and silver, have been slightly developed.

have been built underground at various points to hold back the waters in the old openings. No. 2 shaft has skip tracks laid with 45-lb. rails. The Isle Royale bed is 80' in extreme width in certain levels of No. 10 Huron, the southermost of the old shafts, and the lode is supposed to have been lost in the botton levels at the southern end of the Huron. The mine has about 8 miles of new openings, in addition to stoped-out openings of about 3 miles in the old Isle Royale and Grand Portage mines and about 5 miles in the Huron. The mine has stopes opened for four or five years to come, and no sinking has been done since the middle of 1902. At the close of 1903 eighteen drills were running, of which 15 were stoping and 3 were opening new drifts.

Shafts Nos. 1 and 2 have duplicate equipments, with combination shaft-rockhouses 44x60' on the ground and 90' high, fitted with 18x24" and 13x20" crushers made by the Portage Lake Foundry & Machine Works. Each shaft has a 3,000-ton coal trestle and a two-stage compound 35-drill Nordberg air compressor. The engine houses are 50x90', of steel on stone foundations. The hoists have 18' 6" drums with lathe-turned grooves for 6,000' of 1½" steel cable, built to hoist 6-ton skips from a depth of 6,000'. Boiler houses are 44x72', with coal storage additions 16x72', each housing three 84" 150-h. p. horizontal Burt boilers. The machine shop is 40x60', of steel on stone foundations, with full equipment of tools required for heavy mining work. A dam to impound feed-water for the boilers is 300x500' in area by 6' deep. There are about 100 good dwellings mostly new, on the company's lands.

The Isle Royale Railroad, owned by the company, connects the mine and mill with 4 miles of main line having easy grades and is equipped with one 35-ton and one 55-ton locomotive and forty 40-ton steel rock cars, with air brakes.

The millsite at the mouth of the Pilgrim river, has nearly a mile frontage on Portage Lake. The mill is 134x210', of steel frame on stone foundations, with three 2,000-ton rock bins and three 500-ton Nordberg stamps with circular mortars and ⅜" screen openings. Each stamp has 32-ton mortars resting on anvil blocks, bedded on platforms 20' square and 3' thick, of 16x24"x20' oak timbers. Underneath each platform is a caisson, reaching to bedrock, made of 5-16" boiler steel, 74' long, and 12' in diameter until near the top, where there is a bell-shaped flare, 20' in diameter, to support the oak platforms under the anvil blocks. The caissons and spaces between are filled with concrete. The dressing floor has 72 rough jigs and [illegible] jigs of the Parsall-Krause type, slime tables and 1 Bartlett and [illegible] concentrators to treat the slimes from the circular tables. There is a complete machine shop on the second floor of the mill. A 750-h. p. engine runs the mill and shop, taking steam from four 250-h. p. boilers, in a [illegible] boiler house at the rear of the mill.

[illegible] the mill by a 26,000,000-gallon Nordberg-Corliss pump, [illegible] designed to handle muddy water and having a triple discharge [illegible] each running 2,200' from pump-house to mill, [illegible] distance from the mill to obviate stamp-sand clogging the intake. Three 100-h. p. boilers furnish power for the pumps, fuel being taken from a large coal trestle at the rear of the pumphouse boiler rooms, feed water coming from a dam near the mill.

A 32x600′ wharf at the millsite, with deep water alongside, has appliances for unloading coal cargoes and general freight, and for the dispatch of mineral from the mills to the smelters at Dollar Bay, just across the lake.

The two companies consolidated under the present title each started business with $1,000,000, in cash, in addition to clear title to their lands. The Isle Royale Copper Company also owns $50,000 stock of the Lake Superior Smelting Co. In 1901 the production of refined copper was 11.7 lbs. per ton and in 1902 was 13.5 lbs. per ton of rock stamped, and at the close of 1903 the rock was running about 14 lbs. per ton. In 1901 the cost of mining was $1.20 per ton and of stamping 25c. per ton, and in 1902 mining costs were $1.52 per ton and stamping costs 26.44c. per ton. Production in 1902 was 3,569,748 lbs. of refined copper and 18,523 oz. silver, value of latter being $8,881.61. Cost of copper produced in 1902 was 13.5c. per lb. and for 1903 was probably a little less. The mine ended 1903 on about the same productive basis as the year was begun, owing to the burning of No. 1 shaft. On the present basis of production the mine is probably nearly or quite earning expenses.

ISLE ROYALE LAND CORPORATION, LTD. MICHIGAN.

Offices: 24, North John St., Liverpool, Eng. R. Young, chairman; J. Tibbs, secretary; R. R. Goodell, agent, Houghton, Mich. Name changed from Wendigo Copper Company Ltd., to present title, July, 1901. Capital, nominal, £225,000, shares £5 par. Lands comprise 83,720 acres, on Isle Royale, Lake Superior, Michigan, mainly copper-bearing, and located on the northern fold of the Keweenawan synclinal.

ITSUKI MINE. JAPAN.

Mine office: Itsuki-mura, Kuma-gori, Higo, Japan. Ore is chalcopyrite, associated with iron pyrites, averaging 5% to 6% copper, in veins interbedded in clay-slates. Production in 1900 was 1,080,163 lbs. refined copper.

IVANPAH CONSOLIDATED SMELTING CO. CALIFORNIA.

Office: Wilcox Bldg., Los Angeles, Cal. Said to own the Copper World mine, near Manvel and Blake, San Bernardino county, California, with a 40-ton smelter. Letters returned unclaimed from both places.

JACK TAR COPPER CO. ARIZONA.

A swindling proposition promoted by the notorious Wm. F. Wernse & Co., Bond & Stock Co., 421 Olive St., St. Louis, Mo.

JALISCO COPPER MINING CO. ARIZONA.

Office: 135 So. Broadway, Los Angeles, Cal. Mine office: Nogales, Santa Cruz Co., Ariz. Organized under laws of Arizona, with capitalization $1,000,000, shares $1 par. A. R. Noon, president; W. J. Stevens secretary. Lands, 8, claims, area 160 acres, near Oro Blanco, Pima Co., Ariz. Company advertises desire to send prospectus and full particulars on application, but furnished no returns for this work although repeatedly asked to do so. Stock probably of very little value.

JAMAICA COPPER CO. **JAMAICA**

Office: Baltimore, Md. Organized January, 1903, with capitalization $1,000,000. Lands, 1,000 acres claimed by company to be heavily timbered with logwood, satinwood, ebony, cedar and walnut. Company was endeavoring to float a $500,000 issue of 30-year participating gold debenture guaranteed bonds at last accounts. Company claims that shipments of ore to England have returned 22.31% copper.

JAPAN-FLORA MINES & TUNNEL CO. **COLORADO.**

Office: 310 Colorado Bldg., Denver, Colo. Mine office: Telluride, San Miguel Co., Colo. Employs 30 to 40 men. T. Walter Beam, president and general manager; Wm. E. Humphreys, secretary. Organized August 22, 1903, under laws of Colorado, with capitalization $2,000,000, shares $1 par. Lands, 35 patented claims, area 317 acres, in the Upper San Miguel district, showing 8 fissure veins in andesite breccia carrying auriferous and argentiferous galena and iron pyrites with quartz gangue, averaging about 0.5% copper, 10% lead, 8% zinc, 23.5 oz. silver and $10 gold per ton, opened by a 685′ shaft and 8 crosscut tunnels, two longest 1,600′ and 2,752′, with 19,655′ of underground openings, estimated to give 150,000 tons of ore blocked out for stoping. Has steam and electric power, with 45-h. p. hoist, 2 Leyner air compressors, power drills and shops. Has produced about $650,000 worth of ore and is being developed along systematic and businesslike lines.

JARILLA COPPER CO. **NEW MEXICO.**

Reorganized, 1903, as Three Bears Copper Company.

JASPER MOUNTAIN COPPER CO. **WYOMING.**

Mine office: Douglas, Converse Co., Wyo. H. R. Mewis, superintendent. Was employing a small force in development work, at last accounts.

JEFFERSON COPPER CO.

A fraudulent corporation organized by the Wm. F. Wernse & Co., Bond & Stock Co., 421 Olive St., St. Louis, Mo., solely to swindle, as the company never owned any ground.

JEFFERSON COPPER MINING CO.

A swindle, perpetrated by the notorious W. C. Calhoun, of Denver, Colorado.

JEFFERSON COUNTY MINING CO. **MONTANA.**

Mine office: Basin, Jefferson Co., Mont. Organized by eastern parties for the purpose of leasing the mine of the Basin & Bay State Mining Co., which has been done.

JEFFS LAND CO. **MICHIGAN.**

Office: Rockland, Ontonagon Co., Mich. Owns 800 acres of mineral land, north and west of Rockland, on which a little exploring work was done 1899–1900. Fully described in Vol. I.

JELM TOWNSITE & MINING CO. **WYOMING**

Office: Kasota Blk., Minneapolis, Minn. Mine office: Jelm, Carbon Co., Wyo.

JEROME COPPER CO. **ARIZONA**

Succeeded by Cleopatra Copper Co.

ME SILVER-COPPER MINES CORPORATION. **ARIZONA.**

Office: care of C. D. Smith & Co., 25 Broad St., New York. Mine office: me, Yavapai Co., Ariz.

E CANON COPPER CO. **ARIZONA.**

Office: 106½ South Broadway, Los Angeles, Cal. Mine office: Granite, pai Co., Ariz. Organized 1901, under laws of Arizona, with capital- $1,000,000, shares $1 par. J. W. Tibot, president; G. B. Tibot, ary; Jos. S. Smith, superintendent. Lands, 16 claims, including Copper Glance mine, 14 miles northwest of Jerome. Development ing pushed systematically and effectively under the management of Smith, who is an experienced mining man. Has recently installed power plant, including air compressor, power drills, hoist and pump. a vein ranging from 2′ to 7′ wide, ore from which has given assays up % copper, 60 oz. silver and $110 gold per ton. Standing of officers pany is good and development is along sensible lines.

E BELLE MINING, MILLING & SMELTING CO. **CALIFORNIA.**

Office: 302 Lankershim Bldg., Los Angeles, Cal. Mine office: Daulton, Co., Cal. Organized 1902, under laws of Arizona, with capitalization 0,000, shares $1 par. W. H. Sallada, president; W. T. Carter, secretary. , 3 patented claims, area 40 acres, with 200′ main shaft showing 4 veins carrying oxide, carbonate and sulphide ores assaying 15% % copper, 6 oz. to 10 oz. silver and $8 to $15 gold per ton. Has steam , air compressor and 30-ton concentrator.

S MARIA MINES CO. **MEXICO.**

Mine office: Parral, Chihuahua, Mex. Percy L. Fearn, manager, at accounts. Ores carry gold, silver and copper. Has steam power.

A JESUS MARIA DE BAQUERACHIC. **MEXICO.**

An old property, once of importance, near the Lluvia de Oro mine, the state of Chihuahua, Mexico. Ores are copper sulphides, carrying about . silver and $2 gold per ton. Negotiations looking toward reopening the property are in progress.

L C. MINING CO. **UTAH.**

Office: Salt Lake City, Utah. Mine office: Park City, Summit Co., ah. G. D. B. Turner, general manager; N. A. McLean, superintendent. nds are in the vicinity of the Daly-West and Daly Judge, and are being veloped by a 625′ shaft giving promise of soon cutting a good ore body.

ULCO MINING CO. **MEXICO.**

Office: San Antonio, Texas. Mine office: Jimulco, Coahuila, Mex. to Wahrmund, president; M. J. Welch, vice-president; O. S. Newell, second e-president; S. G. Newton, secretary; John J. Stevens, treasurer; Arthur Little, superintendent. Operates the Guadalupe, Casita and Alfaris nes, producing argentiferous and auriferous copper ores. At last accounts s shipping 40 to 50 tons of rich ore daily to the Aguascalientes smelter, ore being said to average 9% to 10% copper, 20 oz. silver and about gold per ton. Mine, which is in an almost entirely undeveloped district, pened by a 300′ tunnel and a 130′ shaft, and is equipped with gasoline power, employing about 200 men. A tramway is being built from the mine to the Mexican Central railway, and the property is supposed to be earning a profit over and above the cost of development work. Production of refined copper in 1902 was 621 metric tons. Property is well managed and regarded as decidedly valuable.

JOAQUIN MAIZ & CO. **MEXICO**

Office and mine: Villa Aldama, Nuevo Leon, Mex. C. Robles, manager. Was operating a copper property, with fair force, at last accounts.

JOHN DIAS MINE. **CALIFORNIA**

Property, in Section 12, T. 6 S., R. 16 E., Mariposa Co., Cal., is opened by a shallow shaft on a 3′ vein in schistose diabase carrying cuprite, azurite, chrysocolla and chalcopyrite. Ore said to assay $40 per ton in copper and gold.

JOHNNY BULL COPPER MINING CO. **NEW MEXICO.**

Office: Stein's Pass, Grant Co., N. M. Idle since February, 1900, and financial affairs of company in confusion.

JOHNSON MINE. **NORTH CAROLINA.**

Mine office: High Point, Guilford Co., N. C. Was being opened on a small scale at last accounts.

JOHNSON MINES. **WASHINGTON.**

In the Stanaway district of Kittitas county, Washington. Shipped some native copper and high-grade ore to Puget Sound smelters in 1903.

JOHNSTOWN MINING CO. **MONTANA.**

Mine office: Butte, Silver Bow Co., Mont. Is a subsidiary corporation of the United Copper Co., holding title from the Montana Ore Purchasing Co., to the eastern portion of the Rarus mine, which is involved in the Michael Davitt suit between the Heinze and Almalgamated interests.

JOSEPHINE MINE. **WASHINGTON.**

Office: care of Bevis Bros., Spokane, Wash. Property is located in the Metalline camp, Washington. Shafts said to show an 11′ vein at depth of 50′.

JOSEPHINE COPPER MINING & SMELTING CO. **MONTANA.**

Organized 1903, to take over and operate sundry mining claims in the Blackfoot ceded district of Teton county, Montana.

JOSEPHINE GOLD & COPPER MINING CO. **ARIZONA.**

Office: care of Herbert S. Shaw, 15 Brown Palace Hotel, Denver, Colo. Mine office: Prescott, Yavapai Co., Ariz. Organized under laws of Utah, with capitalization $1,500,000, shares $1 par. O. B. Price, Jr., president; E. J. Price, secretary; W. D. Webster, superintendent. Lands, 10 claims, area 200 acres, 8 miles south of Prescott, showing ores, mainly sulphide, giving assays of 3% to 75% copper and 5 oz. to 16 oz. silver per ton, with traces of gold. Has steam power and is being opened by shafts.

JOSEPHINE & CONNECTICUT MINES. **ARIZONA.**

Mine office: Patagonia, Santa Cruz Co., Ariz. Owned by R. K. Richardson and Wm. T. Powers. Ores carry copper, silver and gold. Have steam power.

JOSIE GOLD & COPPER MINING CO. WASHINGTON.

Office: 261 Columbus Ave., Boston, Mass. Mine office: Houghton, King Co., Wash. E. B. Robinson, general manager Lands, 12 claims, in the Snoqualmine district, 35 miles from Seattle. Has several shallow shafts and short tunnels, all in ore giving fair assay values.

MINA LE JOYA. SPAIN.

Office: care of Don Manuel Vazquez Lopez, owner, Huelva, Spain. Lands, 53 hectareas, at El Cerro, Huelva, Spain. Property shows large quantities of cupriferous iron pyrites carrying an average of 48% sulphur. Property is idle pending the installation of a 10-kilometre aerial tram, but it is planned to produce and ship ore in 1905.

MINA JUEZ. MEXICO.

Office and mine: Ameca, Jalisco, Mexico. José Somerla, owner and manager. Employs about 20 men.

JULIA DEANE MINING CO. UTAH.

Mine office: Bingham Canyon, Salt Lake Co., Utah. David Clay, manager. Ores carry gold and copper. Has steam power and is developing by tunnel.

JUNCTION DEVELOPMENT CO. ARIZONA.

Office: Calumet, Mich. Mine office: Bisbee, Cochise Co., Ariz. Chas. Briggs, president; John S. Dymock, vice-president; Peter Ruppe, treasurer; Gordon R. Campbell, secretary; preceding officers, T. F. Cole, Chester A. Congdon, James Hoatson, Thos. Hoatson and Geo. E. Tener, directors; S. A. Parnall, superintendent. Organized 1903, under laws of Arizona, with capitalization $750,000, shares $15 par; paid in, $4. Is closely affiliated in ownership and management with the Calumet & Arizona. Lands, 14 claims, area 200 acres, held under bond and lease. Property lies an eighth to a quarter mile southeast of Sacramento Hill, the keystone of the Bisbee ore deposits. Major portion of tract is covered by conglomerate and it was the theory of the management that this conglomerate overlaid the cupriferous limestone beds. This supposition has been proven at least partially correct, by the limited development already secured. A four-compartment shaft, sunk on the boundary line of the Calumet & Pittsburg to hoist ore from both properties, is less than 1,000′ northeast of the Lowell shaft of the Copper Queen and was 400′ deep at the close of 1903, showing low-grade carbonates with a little chalcocite and chalcopyrite. Shaft is equipped with a double hoist, good for depth of 1,200′, 2 boilers and an air compressor. A type C Sullivan diamond drill is also in use, being the first employed in the Warren district. While the Junction lacks the demonstrated values of the three other development companies under the wing of the Calumet & Arizona, it is a decidedly promising property.

JUPITER MINING CO. WYOMING.

Office: Tomah, Wis. Mine office: Jelm, Carbon Co., Wyo. Dr. C. E. Quigg, president; J. W. Hancock, secretary and treasurer.

JURA-TRIAS COPPER CO. NEW MEXICO.

Office: Commercial Club Bldg., Albuquerque, N. M. Mine office:

Señorito, Sandoval Co., N. M. Thos. J. Curran, president; Geo. W. Stubbs, secretary and treasurer. Organized October, 1900, under laws of New Mexico, with capitalization $1,000,000, shares $1 par. Property is sundry copper claims and a gold mine. Has a 25-ton smelter. No mining was in progress at close of 1903, owing to installation of a new plant.

JUSTICE MINING CO. **COLORADO.**

Mine office: Central City, Gilpin Co., Colo. Lands carry gold, silver and copper.

KAFUE COPPER SYNDICATE, LTD. **RHODESIA.**

Office: 19, St. Swithin's Lane, London, E. C., Eng. Capital, nominal, £100,000. Lands, 1,000 gold claims and a 3,000-acre farm, to be sold to the Rhodesia Copper Co., Ltd., for £125,000 in shares.

KAFVELTORPS KOPPERVERK. **SWEDEN.**

In Orebro Län, Sweden. A small producer, output for 1901 having been 112,590 kgs. of matte, averaging 72% copper, equal to 178,713 lbs. refined copper, and 16,423 kgs. refined copper, giving a net production for 1901 of 214,919 lbs. refined copper. Also secured considerable values in lead and silver, obtained as by-products.

KALAMAZOO COPPER MINING CO. **COLORADO.**

Office: Kalamazoo, Mich. Mine office: Encampment, Carbon Co., Wyo. Idle. Organized April 11, 1902, under laws of Wyoming, with capitalization $1,000,000, shares, $1 par. H. E. Brown, president; E. S. Drury, vice-president and resident manager; Edwin Gillis, secretary and general manager. Lands, 10 patented claims, area 95 acres, in the Pearl district of Larimer county, Colorado, showing 2 fissure veins, opened by shafts of 28' and 40' and giving assays of 2% to 50% copper, with variable values in gold, silver, zinc and nickel, from oxide and sulphide ores. Company is under the same general management as the Coldwater, and has lands adjoining. The Kalamazoo company plans doing no work until the boundary is reached by the Coldwater, when a steam plant will be installed and vigorous development undertaken.

KANGAROO HILLS MINING & SMELTING CO. **AUSTRALIA.**

A consolidation of the Macaulay Creek Silver & Copper Mines and the Mt. Theckla Copper Mine, in the Kangaroo Hills district of Queensland. The Mt. Theckla, opened 1900, produced 23 tons of copper and 6,315 oz. of silver in 1901, from ores averaging 16% copper, 15% lead and 49 oz. silver per ton. The smelter is located midway between the mines, on the Running river.

KANSAS-BURROUGHS CONSOLIDATED MINING CO. **COLORADO.**

Office: Equitable Bldg., Denver, Colo. Mine office: Central City, Gilpin Co., Colo. Patrick McCann, superintendent. Ores carry gold, silver and copper. Has steam power.

KANSAS CITY COPPER MINING & SMELTING CO. **COLORADO.**

Office: Kansas City, Mo. Mine office: Oneco, Routt Co., Colo. Oliver W. Kroll, superintendent. Has steam and electric power and a 40-ton smelter.

KANSAS CITY GOLD & COPPER MINING & MILLING CO. **COLORADO.**

Incorporated August, 1902, to develop mines in Saguache Co., Colo.

KANSAS CITY & SONORA MINING & MILLING CO. **MEXICO.**

Property sold to Ures Consolidated Mining Co. for $25,000.

KAPUNDA MINE. **AUSTRALIA.**

Office and mine: Kapunda, South Australia. Varley & James, owners. Property was opened in 1842 and is 50 miles north of Adelaide. Has been worked by tributors since 1879, until recently. Has 8 shafts, two deepest being about 450′ each. Water level is 50′ below surface. Vein matter and country rock are very soft. Mine has produced at least $1,000,000 worth of copper, and carries oxide, carbonate and sulphide ores, with a little native copper, ores averaging about 18.5% copper. Employs about 25 men.

KAPUNDA COPPER MINE, LTD.

Was to have taken over the Kapunda mine, but did not go to allotment.

KARANKULSKI MINE. **TURKESTAN.**

A small property, operated in a crude way, near Tashkent, Turkestan.

KARGALINSKI GROUP. **RUSSIA.**

Office and works: Orenburg, Russia. E. O. Terner, manager. Production in 1899 was 680,674 lbs. refined copper.

COMPAGNIE DU KATANGA. **CONGO FREE STATE.**

Office: 13, Rue Bredcrode, Brussels, Belgium. Edouard Despret, chairman; Col. A. Thys, managing director; Major A. Cambier, manager; A. J. Wauters, secretary. Organized April 15, 1901, under laws of Belgium, as a subsidiary corporation of the Belgium Congo Company, with capitalization 3,000,000 francs. Lands, 50,000,000 acres freehold, with sundry preferential mining and railway rights. Mining property is four groups, known as the Katanga, Kambove, Pala and Kazemba, located on the left bank of the upper Lualaba river, showing auriferous copper ores. Development is in charge of Grey & Holland, African managers of the Tanganyika Concessions, Ltd., and have not as yet advanced beyond the exploratory stage, but the showing is said to be quite promising.

KATARSKI MINE. **RUSSIA.**

Office: care of H. Lorenz, Elizabethpol, Russia. Is one of the principal copper producers of Russia. Production for 1899 was approximately 4,765,000 lbs. refined copper.

KAWASAYAMA MINE. **JAPAN.**

Mine office: Sanyama-mura, Oe-gori, Awa, Japan. Ore is chalcopyrite mixed with iron pyrites, averaging 4% copper, in a 2′ to 4′ vein in amphibolite. Production in 1900 was 14,834 lbs. refined copper.

KEARNS CONSOLIDATED COPPER MINES CO. **WYOMING.**

Office: 519 Equitable Bldg., Denver, Colo. Mine office: Downington, Carbon Co., Wyo. Employs 6 men. Organized 1899, under laws of Wyoming, with capitalization $1,500,000, shares $1 par. Foster Kearns, president; A. Hanson, secretary; Geo. C. Waterman, superintendent. Lands, 11 claims,

area 216 acres, also the 160-acre townsite of Downington in the Upper Pl
section of the Grand Encampment district, showing 4 fissure veins, of whi
are being developed, principal vein having a width of 40′ and estimated le
of 1 mile, apparently the largest ore body in Wyoming. The 3 smaller v
range from 10′ to 20′ wide. Estimated average values, 2% to 10% cop
$1 to $8 gold per ton, from oxide and carbonate ores above and sulph
at a little depth, opened by 5 shafts, of 10′ to 40′, and a 60′ tunnel.
steam power and sundry mine buildings. Property regarded as valu
and management honest, but development has been done heretofore r
in the newspapers than in the ground.

KEARSARGE MINE. **MICHIG**

Owned and operated by Osceola Consolidated Mining Co. since 1897

KEDABENSKI MINE. **RUS**

Mine office: Kedabensk, Elizabethpol, Russia. Is sometimes ca
the Kiadebek. Is owned by the Gebrüder Siemens, Berlin, Germany,
reopened the property in 1864, since when the mine has been a consider
producer. Ore is mainly chalcopyrite, associated with iron pyrites, pyrrh
and sphalerite, with occasional occurrences of chalcocite and native cop
gangue being quartz and heavy spar. Ore bodies are irregular masse
quartz trachyte veins traversing diorite. Ores average 3% to 5% cop
and are sorted on surface into smelting grade ore averaging 7% and leac
ore averaging 3% copper. Smelter has reverberatory furnaces and b
crude petroleum, which is pumped 30 miles from Dalliar, on the Tr
Caucasion railway, through a pipe-line. Product of first fusion is a 2
to 30% matte, which is broken up and roasted, then blown up to bli
copper in blast furnaces. The blister copper is of low grade, carrying ab
88% to 90% copper, 25 oz. silver and 1.2 oz. gold per ton, and is refi
electrolytically at Kalakent. Production is about 4,000,000 lbs. of refi
copper yearly.

KUPFERKIESBERGBAU KELCHALPE. **AUSTR**

Mine office: Kelchalpe, Tyrol, Austria. A very small producer,
last accounts.

KEMP-KOMAR COPPER MINING CO. **WASHINGT**

Mine office: Loon Lake, Stevens Co., Wash. A. W. Kemp, mana
Ores, oxide and carbonate above and sulphide in lower workings, carry
small gold and silver values, in a 12′ vein with pay-streak of 6″ to
Carload shipments have returned 16% to 20% copper.

KEMPTON MINE. **UT**

Office: care of Col. A. E. Wall owner, Salt Lake City, Utah. A
producer in the Bingham district, securing a little copper as a by-product

KENDRICK & GELDER SMELTING CO. **COLORA**

Absorbed by San Juan Smelting & Refining Co.

KENNETT MINING CO. **MONTA**

Mine office: Virginia City, Madison Co., Mont. W. B. Millard, gen
manager. Has cupriferous gold ores. Has steam power and a 60
stamp mill, employing about 40 men.

KENTUCKY GULCH MINING CO. **COLORADO.**

Mine office: Tin Cup, Gunnison Co., Colo. P. D. McNeil, superintendent. Ores carry gold, silver and copper. Has steam power and employs about 10 men.

KEREMOS COPPER CO., LTD. **BRITISH COLUMBIA.**

Mine office: Olalla, East Yale district, B. C. Dr. A. C. Sinclair, president; E. N. Ouimette, secretary and treasurer; R. W. Northey, superintendent. Organized December, 1900, with capitalization $1,000,000, shares $1 par. Has a few shallow shafts and short tunnels showing a 6′ vein with 18″ paystreak of mispickel carrying 5% to 15% copper. Employs 6 men during the summer months.

KESWICK SMELTING WORKS. **CALIFORNIA.**

Smelters at Keswick, Shasta Co., Cal., owned and operated by the Mountain Copper Co.

KETCHIKAN COPPER CO. **ALASKA.**

Office: care of Russell H. Hanauer, Colman Bldg., Seattle, Wash. Property is on tidewater, near Ketchikan, Alaska.

KEWEENAW ASSOCIATION. **MICHIGAN.**

Office: 87 Milk St., Boston, Mass. J. M. Longyear, agent, Marquette, Mich. A land corporation, owning large tracts in the upper peninsula of Michigan, a portion of the lands being on the Keweenawan copper belt.

KEWEENAW COPPER CO. **MICHIGAN.**

Office: care of W. K. Prudden, Lansing, Mich. Property is an old mine in Keweenaw county, Michigan.

KEY CITY COPPER CO. **BRITISH COLUMBIA.**

Office: care of Capt. Andrew Wasson, president and general manager, Sacramento, Cal. Mine office: Mt. Sicker, B. C. F. W. McCrady, superintendent. Property adjoins the Tyee and Lenora, and is opened by tunnel. Has steam power and employs about 10 men.

KEY TO SUCCESS COPPER MINING, SMELTING & DEVELOPMENT CO. **UTAH.**

Office: care of A. R. Merritt, Duluth, Minn. Organized 1902, under laws of South Dakota, with capitalization $1,500,000. Lands are in the Beaver Lake district of Beaver county, Utah.

KEY WEST MINING CO. **NEVADA.**

Mine office: Bunkerville, Lincoln Co., Nev. S. W. Darling, superintendent. Ores carry nickel, copper and platinum. Has steam power and employs about 20 men.

KEYSTONE GROUP. **ARIZONA.**

Mine office: Globe, Gila Co., Arizona. Finletter & Harvey, owners; J. R. Finletter, superintendent.

KEYSTONE COPPER & GOLD MINING CO. **ARIZONA.**

Office: 502 Park Bldg., Pittsburg, Pa. Mine office: Wickenburg, Maricopa Co., Ariz. Organized 1900, under laws of Arizona, with capitalization $1,250,000, shares $10 par. C. B. McLean, president; W. J. Strassburger, secretary and general manager; W. F. Wilson, treasurer. Lands, 24 claims, in the Blue Tank and Black Rock districts, showing sulphide ore bodies. Idle at last accounts.

KEYSTONE COPPER MINING CO. **NEW MEXICO.**

Office: Bloomsburg, Pa. Mine office: Tres Piedras, Taos Co., N. M. J. P. Rinker, superintendent. Lands, 18 claims, known as the Payroll mine, in the Bromide district, opened to depth of about 250′ and showing a 20′ vein of sulphide ore assaying 6% to 12% copper, with fair gold values. Has steam power and a 50-ton concentrator.

KEYSTONE COPPER SMELTER CO. **MEXICO.**

Office: 330 Drexel Bldg., Philadelphia, Pa. General Mexican office: Apartado 222, Guadalajara, Mex. Mine office: Tapalpa, Jalisco, Mex. Employs 100 men. Organized under laws of New Jersey, with capitalization $300,000, shares $1 par. Robt. P. Molten, president; Edw. E. Cattell, vice-president and chairman of executive committee; Aubrey F. Lee, secretary; Danl. Lamont, Jr., treasurer; Albert L. Waters, general manager; Wm. B. Duesler, general superintendent. Lands, 5 groups, including La Americana and La Palma mines, carrying gold, silver and copper, developed by a 365′ tunnel. Has steam and electric power, a 40-ton concentrator and a 30-ton smelter.

KHAYYAM COPPER CO.

Letters returned unclaimed from former office, 1920-150 Nassau St., New York.

KIADEBEK MINE. **RUSSIA.**

Described under title Kedabenski Mine.

KILLINGDAL KOBBERVAERK. **NORWAY.**

Office: care of Bede Metal & Chemical Co., Hebburn-on-Tyne, England. Produces cuprous iron pyrites, carrying about 2.5% copper, sold to burners in Norway and England. Production in 1900 was 17,700 tons of ore, equivalent to about 1,000,000 lbs. refined copper.

KIMBALL CREEK MINING CO. **WASHINGTON.**

Office: Seattle, Wash. Mine office: Berlin, King Co., Wash. J. T. Wright, superintendent. Ores carry gold, silver and copper. Has water power and employs 15 to 20 men.

KIN-E-CHY MINING & MILLING CO. **ARIZONA.**

Office: 1112 Majestic Bldg., Detroit, Mich. Mine office: Wilcox, Graham Co., Ariz. Capitalization $1,000,000, shares $1 par. Herman Knorr, president; Fred. P. Obenauer, secretary and treasurer; Lands, 19 copper claims and 7 gold claims, area about 500 acres, near Wilcox. Company has a mill, which went into commission October, 1903. The copper ores carry considerable silver values.

KING COPPER MINING CO. OF NEVADA. **NEVADA.**

Office: 431 Exchange Bldg., Boston, Mass. Mine office: Lovelock, Humboldt Co., Nev. T. H. Lowe, superintendent. Property is the Anderson mine, carrying auriferous and argentiferous copper ores. Was developing with 8 to 10 men at last accounts.

KING DEVELOPMENT CO. **ARIZONA.**

Mine office: Jerome, Yavapai Co., Ariz. G. W. Hull, superintendent. Was developing the Jerome and 1888 claims, with small force, at last accounts.

KING GOLD & COPPER MINING CO. **WASHINGTON.**

Office: Davenport, Wash. Mine office; Springdale, Stevens Co., Wash. Jas. B. Tuttle, superintendent. Property is the Edna-Gladiator mine, 9 miles west of Springdale, opened by a 260′ shaft in a contact vein between diorite and quartz carrying tenorite and chalcocite of $10 to $35 value per ton, with a silicious gangue. Has steam power, a 60,000-gallon pump, hoist and 8-drill air compressor, and is arranging to make small smelter shipments.

KING GOLD & COPPER MINING & MILLING CO. **CALIFORNIA.**

Office: 921-185 Dearborn St., Chicago, Ill. Mine office: Victor, San Bernardino Co., Cal. Company advertises to give an absolutely guaranteed investment, consequently must be regarded with suspicion.

KING MINING CO. **WYOMING.**

Office: Fremont, Neb. Letter returned unclaimed from former mine office, Riverside, Carbon Co., Wyo. T. Carroll, president and general manager; J. O. Bell, secretary; J. H. Knowles, treasurer.

KING SOLOMON MINE. **BRITISH COLUMBIA.**

Office: care of D. C. Corbin, owner, Spokane, Wash. Mine office: Greenwood, B. C. Shipped about 700 tons of ore in 1902. Idle, but plans shipments on completion of the Morrison spur.

KING SOLOMON TUNNEL MINING CO. **COLORADO.**

Mine office: Frisco, Summit Co., Colo. James H. Myers, superintendent. Ores carry gold, silver, lead and copper. Employs about 10 men.

KINGMAN CLAIM. **CALIFORNIA.**

Mine office: Darwin, Inyo Co., Cal., Jas. McDonald, owner. Ores are malachite, cuprite and calcopyrite, carrying a little gold and silver, in a 3′ contact vein between limestone and granite.

KITANNING COPPER MINING CO. **WASHINGTON.**

Office: 114 Cherry St., Seattle, Wash. Letter returned unclaimed from former mine office, Index, Snohomish Co., Wash. W. C. Rutter, superintendent.

KITTICOOLA GOLD-COPPER MINE, LTD. **SOUTH AUSTRALIA.**

Office: care of T. S. Backhouse, Glenelg, South Australia. Mine office: Reedy Creek, South Australia. Is a small producer, property being held under lease from the Australian Mining Co., since 1879. Is 34 miles northeast of Adelaide, and was opened 1845. Is sometimes known as the Tungkillo mine. Ores are rich but bunchy, and in early days averaged 22% copper. Has two main veins, one apparently worked out, and on Baker's lode has shafts of 240′ and 360′.

KITTILSLAND KOBBERVAERK. **NORWAY.**

Letter returned unclaimed by former owners, N. Kior & Co., Christiania, Norway. Property idle at last accounts.

BERGVERWALTUNG KITZBUHEL. **AUSTRIA.**

A small producer in the Tyrol, Austria.

KJOLI GRUBE. **NORWAY**

Mine office: Reitan, Norway. Owned by Cape Copper Co. Idle.

BERGVERWALTUNG KLAUSEN. **AUSTRIA.**

Mine office: Klausen Pfunderberg, Tyrol, Austria.

FAHLERZBERGBAU GROSS-UND KLEINKOGEL. **AUSTRIA.**

A very old mine in the Austrian Tyrol. Said to be nearly exhausted, but continues a small producer.

GEWERKSCHAFT KLINGENTHAL-GRASLITZER KUPFERBERGBAU. **GERMANY.**

Mine office: Klingenthal in Sachsen, Germany.

KLIPKOP (NAMAQUALAND) COPPER SYNDICATE, LTD. **CAPE COLONY.**

In voluntary liquidation.

KNICKERBOCKER DEVELOPMENT CO. **MONTANA.**

Mine office: Helena, Lewis & Clarke Co., Montana. Lands, 8 claims, just north of Helena.

KNOCKMAHON MINES. **IRELAND.**

Old properties, long idle, near Waterford, Ireland. Ore occurs in clay slates and averaged 10% copper when worked. Annual production was about 1,000 tons, circa 1840. Property said to be worthy of investigation.

KOEI MINE. **JAPAN.**

Mine office: Tsunekanemaru-mura, Ashina-gori, Bingo, Japan. An old property, reopened 1893. Ore is chalcopyrite, associated with sphalerite, iron pyrites and micaceous hemitite, in a fissure vein 4′ to 8′ wide, with gangue of talc and hornblende. Country rock is hornblende-granite. Concentrated ore averages 13.4% copper and 4% silver. Production in 1900 was 88,495 lbs. refined copper.

KOKOMO-PIONEER MINING & MILLING CO. **COLORADO.**

Mine office: Dumont, Clear Creek Co., Colo. E. H. Wilson, superintendent. Property includes the Kokomo, Pioneer and Milton mines, producing ores of gold, silver, lead and copper. Has steam, water and gasoline power and 30-stamp mill, employing about 25 men.

KOKUSEI MINE. **JAPAN.**

Mine office: Kawabe-mura, Shonan-gori, Mimasaka, Japan. Was opened 1882. Ore is chalcopyrite, mixed with iron pyrites and small quantities of sphalerite, ore occurring as lenses, the largest 60′ in diameter, with clay gouge, in sandstone and clay-slate. Output in 1899 was 348,497 lbs. refined copper.

KOMAKI MINE. **JAPAN.**

Located in the provinces of Ugo and Rikuchu, Japan. A very old mine, giving considerable gold as a by-product. Annual production, according to latest returns secured, averages about 1,000,000 lbs. refined copper.

KÖNIGLICHE UND HERZOGLICHE COMUNION. **GERMANY.**

Office and works: Oker, Germany. Has a custom smelting plant, treating copper ores.

KOOTENAI COPPER-GOLD MINING CO.

Office: 15 Exchange pl., Jersey City, N. J. Incorporated November, 1902, under New Jersey laws, with capitalization $500,000, by Horace B. Gould, John R. Turner and Louis B. Dailey. Location of lands, if any, not learned.

KOOTENAI COPPER MINING & SMELTING CO. **IDAHO.**

Office: care of C. D. Porter, president, Spokane, Wash. Mine office: Port Hill, Kootenai Co., Idaho.

KOSAKA MINE. **JAPAN.**

Mine office: Kosaka-mura, Kazuno-gori, Rikuchu, Japan. Owned by the Fujiti Gumi. F. Kuhara and K. Taketa, managers. Mine has steam, water and electric power and a good smelter, employing about 2,500 men. Ores are of a considerable variety, including azurite, malachite, chalcopyrite, native copper and native silver. Ore body occurs as an impregnation, ranging from 20′ to 300′ in workable width, with proven length of 2,500′ and opened to depth of 300′. Country rocks are Tertiary tuff, with intrusions of liparite and dacite, ore body being near the contact of dacite with tuff. Property is one of the most profitable in Japan. Production for 1900 was 856 momme gold; 1,059,653 momme silver and 2,168,756 lbs. copper.

KOSK CREEK GROUP. **CALIFORNIA.**

Claims near Olena, Shasta Co., Cal. Native copper is found in joints of the upper portion of a 200′ strata of basalt, with sulphide ores below.

KREMLIN MINING CO. **UTAH.**

Mine office: Bingham Canyon, Salt Lake Co., Utah. D. M. Houston, superintendent. Ore carries copper and gold. Has steam power and employs a small force.

KRUGER COPPER & SILVER MINING CO. **MEXICO.**

Office: 131 State St., Boston, Mass. Mine office: Cusihuiriachic, Chihuahua, Mexico. Organized Sept., 1903, with capitalization $500,000, shares $5 par. Edw. Glines, president; Phillip A. Warner, vice-president and consulting engineer: James H. Mahoney, secretary and treasurer; Geo. W. Boyce, general manager. Lands, 42 pertenencias, area 104 acres, having an old 60′ shaft. Company plans active development. Company was endeavoring at close of 1903 to float its shares in England.

KUNE MINE. **JAPAN.**

Owned and operated by Furukawa Copper Co.

KUPFERKIESBERGBAU KUPFERPLATTE. **AUSTRIA.**

Mine office: Kitzbühel, Tyrol, Austria. Ore is chalcopyrite with quartz gangue, occurring as horizontal beds in Silurian slates. Is one of the principal copper producers of the Austro-Hungarian empire.

KUROTAKI MINE. **JAPAN.**

Mine office: Motokawa-mura, Tosa-gori, Tosa, Japan. Is a short distance only from the famous Besshi mine. Ore is chalcopyrite, first-quality averaging 10% and second-grade 2% to 4% copper. Beds are much contorted, principal thickness and values being found in the saddles and troughs, which average about 10′ thick. Output for 1900 was 151,890 lbs. refined copper.

KURTZ-CHATTERTON COPPER MINING CO. **WYOMING.**

Office: 310 Fisher Bldg., Chicago, Ill. Letter returned unclaimed from former mine office, Encampment, Carbon Co., Wyo. Capitalization $1,[illegible]00, shares $1 par. L. D. Godshall, superintendant. Lands, 100 acres, veloped by several shallow shafts and a 1,700′ tunnel, latter showin veins of low-grade sulphide ore, widest 17′, giving average assays of copper with traces of gold. Veins traverse granite and ore is well adap to concentration. Equipment includes steam power plant, 5-stamp mill 50-ton concentrator. Property is developing with a force of about 40 m

KUSAKURA MINES. **JAPA**

Owned and operated by Furukawa Copper Co.

KVANANGENS KOBBERGRUBER. **NORWA**

Owned by Consul Nils Persson, Helsingborg, Sweden. Mine offic Kaafjord, Finmarken, Norway. Otto Witt, general manager; P. W. Georg mining engineer; Peter Iversen, mining captain. Lands, 50 patent claims, area 300 acres, showing about 20 fissure veins of sulphide ore in pyrit these having an average width of 3′ and length of 1,000′.

LA CANANEAS COPPER CO. **MEXIC**

Office: care of Ehud N. Darling, secretary, 10 Wall st., New York. Mi office: La Cananea, Sonora, Mex. Fred A. Trittle, president. Was promot by Henry B. Clifford & Co. Present management understood to be in t hands of P. Sandoval & Co., substantial bankers of Nogales, Ariz., and Nogal Sonora, Mex. Organized under laws of Arizona with capitalization $5,000,0 shares $5 par. Lands, 230 acres, including La Libertad and El Ultimat groups, near the Greene Consolidated. Property thought to be promisi but management heretofore has been inclined to undue boastfulness. Mes Sandoval & Co. are energetic and thoroughly reliable, and, if under their management, the property may become valuable.

LA CLEDE GOLD & COPPER MINING CO. **COLORAD**

Office: Kittredge Bldg., Denver, Colo. Mine office: Ohio, Clear Creek C Colo. Organized November, 1903, with capitalization $1,000,000, sha $1 par. J. H. Holloway, president; I. E. Black, secretary. Lands, 80 acr also a 3-year bond and lease on the Ohio mine, opened by a 330′ shaft a 900′ tunnel and having steam power. The Ohio has produced about $250,0 worth of ore, but was flooded by cutting an underground watercourse an was idle until taken by present company.

LA DICHA MINING & SMELTING CO. OF MEXICO. **MEXICO**

Stock controlled by Mitchell Mining Co.

LA DURA MILL & MINING CO. **MEXICO**

Mine office: Dura, Sonora, Mexico. Produced 150 metric tons of coppe matte in 1902.

LA FLORENCIA GOLD & COPPER CO. **MEXICO**

Office: 30 South Ninth St., Richmond, Va. Mine office: Cos, Sonor Mex. Employs about 20 men. D. A. Ainslie, president; R. F. Hudso secretary; Tom L. West, general manager. Organized 1902, under laws West Virginia, with capitalization $1,000,000, shares $1 par. Lands, 1 pertenencias, area about 330 acres, showing wide belt mineralized with hea iron capping traceable 2 miles. Main shaft, 250′, with crosscut 50′ in assaying 5% to 9% copper, with fair gold and silver values, and is sinking a second shaft. Management considered honest and property valuable.

LA FLORIDA MINING, MILLING & DEVELOPING CO. **MEXICO.**

President dead; company probably ditto.

LA MANGIARDE, LTD. **FRANCE.**

Mine office: La Tour-sur-Tinee, Alpes Maritime, France. Has coal mines and sundry undeveloped copper deposits in the neighborhood of Nice.

LA PLATA CONSOLIDATED MINING CO. **UTAH.**

Office: 310 Converse Bldg., Boston Mass. Mine office: Ogden, Weber Co., Utah. Howard Carpenter, president; A. W. Mansur, secretary; U. V. Withee, manager. Values in ore developed are chiefly in silver and lead, with a little copper, but there are indications that copper deposits of importance may be encountered later.

LA SAL COPPER MINING CO. **COLORADO.**

Office and mine: Cashin, Montrose Co., Colo. Employs about 50 men. Organized 1899, under laws of Colorado, with capitalization $100,000, shares $100 par. Has paid dividends of $24,000. L. G. M. Gates, president and treasurer; James N. McBride, secretary and general manager. Lands, 10 claims, area 150 acres, showing 5' vein giving assays of 8% copper, with good gold and silver values. Has 1 shaft and 3 tunnels, with about 5,000' of underground openings, and management claims to have about 27,000 tons of ore blocked out for stoping. Has water and steam power, with a small smelter at the mine, shipping product as matte carrying 49% copper and 1,200 oz. silver per ton. Also has a leaching plant. Copper production for 1903 of 3,000,000 lbs., estimated by company, failed to materialize.

LA SOLEDAD MINING CO. **MEXICO.**

Mine office: Ameca, Jalisco, Mex. C. D. O'Brien, manager. Has copper ores developed by tunnel and employs about 20 men.

LA UNION COPPER MINING CO. **ARGENTINA.**

Mine office: Humahuaca, Jujui, Argentina. Has steam power and a small smelter, employing about 100 men.

LABOR CO-OPERATIVE GOLD, SILVER & COPPER MINING CO. **BRITISH COLUMBIA.**

Office: 99 Washington St., Chicago, Ill. Mine office: Golden, B. C. Organized under laws of British Columbia, with capitalization $150,000, shares 10 cents par. Philip Chesley, president; Rev. C. E. Nylin, secretary and treasurer. Company has peddled stock assiduously among poor people, and its officials and agents have not hesitated to lie outrageously to secure money. Its secretary, Nylin, operates under the garb of religion. Other officers have repudiated Nylin's methods, but permit him to remain in charge, and profit by his actions, consequently, all are equally culpable. Outfit is thoroughly rotten.

LACLEDE CONSOLIDATED GOLD & COPPER MINING CO. **OREGON.**

Office: 518 Broadway, Albany, N. Y. Mine office: North Powder, Union Co., Ore. W. J. Curtis, secretary; J. H. Downs, superintendent.

much gophered by numerous short tunnels and pits, whence former owners extracted rich ores in a random manner. Final payment of $31,000 on lands was made Nov. 30, 1903. Property shows 3 copper ore bodies, of which 2 are being developed, these being fissure veins, averaging 6′ in width. The main vein, 6′ to 7′ wide, has a quartzite footwall and dips at about 35°. Ore carries gold and silver values and free gold has been found in the shaft. Ore, as opened, is highly silicious and ferruginous, hence valuable for fluxing the sulphide ores undoubtedly existing at greater depth. Mine is opened by a 140′ vertical shaft, sunk in low ground, cutting diagonally through about 30′ of ore, and bottomed in quartzite. Shaft makes about 150 gallons of water per minute and a 500-gallon station pump has been ordered. There are also three tunnels, known as the Anderson, Carlton and Holt, of 200′, 250′ and 500′ length. The mine has about 4,600′, of openings, and the ground is soft, requiring heavy timbering. Equipment includes steam plant, air compressor and power drills. Mine is served by the Phoenix & Eastern railroad, distant 18 miles, with good wagon road connection. Company plans making a smelter test.

LAKE SUPERIOR & BISBEE DEVELOPMENT CO. ARIZONA.

Office: Calumet, Mich. Mine office: Bisbee, Cochise Co., Ariz.

LAKE SUPERIOR & PITTSBURG DEVELOPMENT CO. ARIZONA.

Office: Calumet, Mich. Mine office: Bisbee, Cochise Co., Ariz. Employs about 60 men. Chas. Briggs, president; John S. Dymock, vice-president; Peter Ruppe, treasurer; Gordon R. Campbell, secretary; James E. Fisher, assistant secretary; preceding officers, Thos. F. Cole, Chester A. Congdon, Jas. Hoatson, Thos. Hoatson and Geo. E. Tener, directors; Samuel A. Parnall, superintendent; John Hoatson, assistant superintendent. Organized May 11, 1902, under laws of Arizona, with capitalization $400,000, shares $10 and full paid. Lands, 3 claims in fee and 43 claims under bond and lease, area 640 acres. Has 2 shafts with about 8,000′ of underground openings. Present flow of water is small, but will increase at depth. No. 2, or Cole shaft, the principal opening, an old shaft now 1,100′ deep, was sunk nearly 1,000′ by previous owners, and will require cutting down to larger size for operating purposes, as it has only two 4x4′6″ compartments. Principal developments are on the 1,100′ level, a 700′ drift on the north showing good ore, while a drift of about 1,000′ on the south cut 130′ of high grade ore, and after passing through about 50′ of lime and iron cut another good ore body. Apparently the drifts on this level correspond with the openings on the 850′ level of the Calumet and Arizona, and open merely the tops of the ore bodies, but the ore is of phenomenal richness, even for the Warren district, showing large bodies of oxides and carbonates assaying 25% to 55% in tenor, with occasional native copper. No. 3 shaft, 900′ deep, is one-half mile south of No. 2 and will be connected therewith by drifts now driving. Surface equipment includes a 500-h. p. plant, with good hoists, air compressor, etc.

The 43 claims held under bond and lease were taken over from the South Bisbee Copper Mining & Townsite Improvement Co., a local corporation that begun work in 1898. Price of lands was $1,200,000, of which $150,000 has been paid and $1,050,000 is payable June, 1904. Funds for the payment of the balance due will be raised by reorganization as a mining company which will probably have a capitalization of 250,000 shares, par value $10 or $15 per share. Shareholders of the South Bisbee company are engaged in litigation among themselves over the division of the proceeds of this sale, and the dissident local shareholders in Bisbee are endeavoring to embroil the Lake Superior and Pittsburg in this litigation, but so far have been unsuccessful. There has been talk to the effect that the Lake Superior & Pittsburg may not be able to acquire valid title to its lands, owing to this litigation, but careful review of all the circumstances in the case shows that the bond and lease was executed with the full consent and hearty approval of every shareholder of the South Bisbee company, and while it may be necessary for the Lake Superior & Pittsburg to pay the final installment of $1,050,000 into court, pending the settlement of litigation, it is impossible to see how any valid case can be made against the company that will impair or defeat its title, as every obligation in the bond and lease has been lived up to most scrupulously, under the best legal advice.

The Lake Superior & Pittsburg gives every promise of making one of the very largest and richest copper mines ever opened. So vast are its possibilities that a forecast based upon absolutely correct data might be received with suspicion as a gross exaggeration. It may be said, however, with perfect safety, that the Lake Superior & Pittsburg gives every indication of making not only a richer, but a larger mine than the Calumet & Arizona, which already ranks among the ten largest copper producers of the world.

LAKESIDE GOLD-COPPER MINING CO. WASHINGTON.

Letter returned unclaimed from Spokane. Capitalization, $1,000,000, shares, $1 par. Geo. W. Weatherbee, president; Frank Kimball, vice-president; L. A. Sweetser, secretary and treasurer; E. W. Berry, general manager. Lands, 7 claims, in the Index district of Snohomish county, Washington.

SUCESION C. J. LAMBERT. CHILE.

Mine office: Brillador, La Serena, Coquimbo, Chile. Operates La Compania mine, opened 1850, making 500 to 700 tons of refined copper yearly. Also owns the Bronces mine, 550′ deep, opened 1840, now idle, and has an extensive smelting plant, employing about 500 men.

ERZBERGWERK LAMPERTUS. GERMANY.

Mine office: Hohenstein-Ernsthal, Sachsen, Germany.

LANCELOT FREEHOLD TIN & COPPER MINES, LTD. AUSTRALIA.

Registered May 27, 1903, with capitalization £120,000, shares, £1 par, to take over property of the Lancelot Tin Mining Co., Ltd., in liquidation. Lands, 55 acres, near Herberton, Queensland, Australia, carrying tin, copper, bismuth and wolfram.

MINA LA LAPILLA. SPAIN.

Mine office: Alosno, Huelva, Spain. Wm. Guthrie Bowie, manager. A group of government concessions adjoining the Tharsis mine. Has an extensive plant. Ore ranges from 2.5%to 8% copper, and 47% to 50% sulphur. Ore body, lenticular and very wide. Was formerly operated by pillar-and-stall, leaving large quantities of ore in floors and pillars. Has about 1,200,000 tons of ore available underground, and much more if worked open-cast. Output is lessened because of poor ventilation. Property shows enormous quantities of scoria, left from smelting operations of the Romans.

LARDEAU-DUNCAN MINES, LTD. BRITISH COLUMBIA.

Office: 5 Wolverton Blk., Spokane, Wash. Organized under laws of British Columbia, with capitalization $150,000, shares 10c. par. John MacKenzie, president; A. H. Wheatley, secretary and treasurer. Lands, 3 claims, area 150 acres, with 4 adjoining claims under option, on Cariboo Creek, in the Lardeau-Duncan district of British Columbia, showng a quartz vein carrying gold, copper, silver and zinc, with a strong gossan capping carrying a little azurite. Development is by open cut and a short tunnel, giving ore returning average assay values of $19 per ton, mainly in gold and copper.

LAS ADARGAS MINING CO. MEXICO.

Office: 15 John St., New York. Mine office: Jiminez, Chihuahua, Mex. Claims to be organized under laws of New York, with capitalization $1,000,000, shares $10 par. E. G. Seiler, president; Geo. E. Crawford, secretary; W. A. Seamon, general manager, El Paso, Texas. Has a 300′ shaft. Declared a dividend of 25 cents per share, April, 1902. Property said to be held under a bond of $300,000, on which $15,000 has been paid.

LAS ANIMAS COPPER MINING & SMELTING CO., LTD. CHILE.

Offices: 2, Rumford Pl., Liverpool, England. Mine office: Chañaral, Atacama, Chile. Archibald Boxburgh, chairman; Pedro Nicolas Schjölberg, managing director in Chile; F. E. Owens, secretary; Guillermo Sheriff, mine manager. Organized June 3, 1902, with capital, nominal, £20,000; issued, £15,000, to acquire property of the Copper Corporation of Chili, Ltd., from bondholders of that company. Lands, 608;500 sq. yds., including the Fortunata mines, 430′ deep opened 1855; Alena and Progreso mines, at Las Animas, and smelting plant at Chañaral, which was blown in March 3, 1902.

LAS ANIMAS GOLD-COPPER MINING CO. NEW MEXICO.

Office: 50 State St., Boston, Mass. Mine office: Hillsboro, Sierra Co., N. M. Employs 15 men. Organized 1900, under laws of West Virginia, with capitalization $1,000,000, shares $1 par. Jas. P. Mallete, president and general manager; Wm. T. D. Treefry, secretary and treasurer; W. W. Williams, superintendent; L. W. Getchell, consulting engineer. Lands, 4 claims, in the Hillsboro district, showing a fissure vein averaging 8′ wide with length of 3,500′ and giving assays up to 10% copper, 15 oz. silver and 2 oz. gold per ton, from oxide and sulphide ores. Has shafts of 150′ and 400′, also 3 tunnels. Has 4,000′ of underground openings, and estimates 100,000 tons of ore in sight and 60,000 tons blocked out for stoping. Has steam and gasoline power, with hoist good for depth of 1,000′. Nearest railroad is 22 miles. Company contemplates building a 50-ton mill and concentrator.

LAS ANIMAS MINING & SMELTING CO. MEXICO.

Mine office: Altar, Sonora, Mex. Lands include Las Animas, Purgatorio and other mines carrying copper ores. Has steam power and employs a small force on development work.

LAS MORES COPPER CO. **MEXICO.**

Mine office: Ameca, Jalisco, Mex. G. E. McCormick, president and general manager. Has argentiferous oopper ores of good grade, and at close of 1903 was planning construction of a large concentrator, with smelter to be added later.

LAS TUSAS MINING & MILLING CO. **NEW MEXICO.**

Mine office: Tres Piedras, Rio Arriba Co., N. M. Lon. L. Trout, general manager. Has auriferous copper ore, with steam power, and employs 10 to 15 men.

LAS VEGAS COPPER CO. **NEW MEXICO.**

Office: East Las Vegas, N. M. Property is the Tecolote mine in San Miguel county, New Mexico. Capitalization $100,000, shares $1 par. F. A. Manzanares, president; J. M. Thompson, secretary; J. M. Allen, treasurer and general manager; Frank J. Buck, consulting engineer. Mine has auriferous and argentiferous copper ore, also a vein of bluestone or natural copper sulphate. Has steam and electric power, also concentrator, built 1903, and employs about 40 men. Company claims to have developed about 5,000,000 tons of carbonate ore.

LAS VIGAS MINING CO. **MEXICO,**

Office: care of Geo. E. Voorhees, Jr., Santa Barbara, Cal. Mine office: Las Vigas, Coyame, Chihuahua, Mex. Employs 48 men. Carlos P. Halter, general manager. Lands, 74 pertenencias, area 173 acres, showing 19 ore bodies, as fissures in sandstone and as contacts between sandstone and what is probably clay-slate, ores occurring as impregnations and replacements in the sandstone. Four of these bodies are being developed, these averaging 7′ to 12′ width and giving average returns of 7.5% copper and 3 oz. silver per ton, mainly from bornite and chalcopyrite, with occasional oxides, carbonates and native copper. Has shafts of 61′, 98′, 125′ and 179′, with 3 short tunnels, estimated to develop 60,000 tons of ore. Property was formerly worked by the Spaniards. Has steam power, hoists and air compressor. Buildings include office, store and 19 dwellings. Ore is hauled by a Buffalo-Pitts traction engine to Las Trancas station, 43 miles distant, on the Kansas City, Mexico & Orient railroad. Production of refined copper in 1902 was about 65 tons and for 1903 reached about 150 tons. Plans of management call for vigorous development and erection of a smelter as soon as an assured tonnage is developed.

LAST CHANCE COPPER MINING CO. **WASHINGTON.**

Mine office: Keller, Ferry Co., Wash.

LAST CHANCE MINING CO. **ARIZONA.**

Mine office: Williams, Coconino Co., Ariz. C. H. McClure, superintendent. Ores carry copper, gold and silver. Mine is opened by shaft and tunnel, has steam power and employs about 25 men.

LATHAM MINING & SMELTING CO. **NEVADA.**

Office: 224 D. F. Walker Bldg., Salt Lake City, Utah. Mine office:

Sprucemount, Elko Co., Nev. Organized under laws of Utah, with capitalization $1,000,000, shares $1 par. Jacob H. Jacobson, president; Geo. L. Moates, vice-president and general manager; R. P. Hills, secretary. Lands, 8 claims, area 160 acres, 48 miles south of Wells, showing 7 fissures giving average assay values of 7% copper and 7 oz. silver per ton, also a promising silver-lead vein opened by a 400′ shaft and tunnels of 700′ and 900′, with about 3,000′ of underground openings. Has a 50-ton concentrator and smelter with 3 small water-jacket furnaces.

LATIMER COPPER MINING CO. **GEORGIA.**

Mine office: Pierceville, Fannin Co., Ga.

LATOUCHE ISLAND COPPER MINING CO. **ALASKA.**

Office: 49 Sullivan Bldg., Seattle, Wash. Capitalization $7,500,000, shares $5 par. Jas. A. Murphy, president; Solon T. Williams, secretary. Lands, 29 claims on Latouche Island, Prince Williams Sound, Alaska, about 60 miles west of Valdez, not far from tidewater. Development is by a 75′ tunnel. Ore is claimed to give assay values of $30 to $40 per ton.

LAURA-PEARL MINING & MILLING CO. **COLORADO.**

Mine office: Newett, Chaffee Co., Colo. F. H. Denman, superintendent. Ores carry gold, silver and copper. Has steam power and employs about 15 men.

LAURIUM MINING CO. **MICHIGAN.**

Office: 301-199 Washington St., Boston, Mass. W. J. Ladd, secretary and treasurer. Owns lands adjoining the Calumet & Hecla, at Laurium, Houghton Co., Mich., of doubtful mineral value, but in good demand for building purposes.

L'ETETE GOLD & COPPER MINING CO. **NEW BRUNSWICK & NOVA SCOTIA.**

Mine office: L'Etete, Charlotte Co., New Brunswick. Old Johnston mine, at L'Etete, opened circa 1860, reopened 1902, has two short tunnels and 145′ main shaft, showing ore of good assay value. Has steam plant, and shipping facilities at tidewater. Company also owns mineral lands in Nova Scotia.

LE ROI MINING CO., LTD. **BRITISH COLUMBIA.**

Offices: Salisbury House, London, E. C., Eng. Mine office: Rossland, B. C. Employs about 400 men. Sir Henry Tyler, chairman; L. C. F. Robson secretary; S. F. Parrish, general manager; E. J. Wilson, smelter superintendent. Registered June 7, 1898, with capital £1,000,000, shares £5 par. Lands, 70 acres, also the I. X. L. mine held under lease. Ore body is narrow at top and wide at bottom, but values decrease at depth, smelter returns for fiscal year 1902 averaging 1.526% copper, 0.709 oz. silver and 0.373 oz. gold per ton. Main shaft has 4 compartments and is 1,350′ deep, mine showing reserves of about 500,000 tons of ore, and diamond drill holes, bored from the bottom of the shaft, prove a continuance of the vein to greater depth. Property has a good mining equipment, including hoists, air compressors, power drills, shops, steam shovel and sampling mill, and at close of 1903 planned building a concentrator to use the Elmore oil process, which has proven so successful at the Le Roi No. 2, Ltd.

The 1,500 ton smelter is 17 miles from the mine, at Northport, with rail connection, abundant water supply and a limestone quarry for flux only four miles distant. Pyritic smelting is employed and ore is heap-roasted before matting. Product of second fusion is matte of 35% to 40% tenor, shipped east for refining. Flue-dust is briquetted, lime being used as a binder. The plant has three calcining furnaces and six 250-ton water-jacket blast furnaces, with mechanical feed installed in 1903. For the fiscal year 1902, production was about 4,750,000 lbs. of refined copper, and for November 1903 the production was 17,860 tons of ore, carrying 303,692 lbs. of copper, 6,665 oz. of silver and 7,294 oz. of gold. Property has been a considerable dividend payer, though operations for past two or three years have not been so profitable as formerly, but prospects are now much better than for several years past.

LE ROI No. 2, LTD. BRITISH COLUMBIA.

Offices: Salisbury House, London, E. C., Eng. Mine office: Rossland, B. C. Employs aboout 200 men. Lord E. Hamilton, chairman; F. A. Labouchere, secretary; P. S. Couldrey, manager. Registered June 1, 1900, with capital £600,000, shares £5 par. Lands, 72 acres, including the Josie and No. 1 mines, carrying auriferous and argentiferous copper ores. The mine is extensively developed, showing ore reserves of about 300,000 tons.

In common with the other mines of the Rossland district, the Le Roi No. 2 has experienced difficulties caused by decreasing ore values at depth and ores much inclined to sliming and difficult of concentration, ordinary processes of wet concentration proving wasteful and ineffective. An Elmore oil concentration plant was installed in 1903, this plant having two units, of 25 tons daily capacity each, the first started Oct. 2 and the second in November, 1903. The concentrator has heavy timber framing with stone and concrete foundations and is terraced, permitting the handling of all material by gravity, a surface tram connecting with the ore dumps. Ore is first reduced to 3″ size in a Blake crusher, then to ½″ size in a Gates crusher and then to an average of 30-mesh size in two Trent rotary mills, going thence to Wilfley tables. The tallings from the Wilfleys, containing large quantities of finely comminuted ore particles, are then conducted to the oil concentrators proper. These consist of sets of three superimposed horzontal cylindrical iron tanks, known as mixers, drums being revolved slowly by spiral shafts. At the discharge end of the upper tank a quantity of oil charged with mineral is delivered, balance of material going to the second drum, which similarly delivers concentrates, and thence to the third for the same process, tailings being discharged from the third and bottom drum. The mineral in the oil goes thence to centrifugal separators, rotated at 1,000 revolutions per minute, which effect a partial recovery of the oil, concentrates going thence to perforated separators for final oil extraction after which they are drawn off for shipment, hot water being fed into the separators when oil is in process of displacement. The oil used is a thick residual, with a specific gravity of about 0.9, quite viscous and of about the consistency of common cylinder oil, a ton of oil carrying 100 to 200 pounds of sulphides. Before extraction by the centrifugal separators, material is heated to about 100° Fahrenheit, to render the oil thin, and the extracted oil is used repeatedly. The amount of oil lost by shipping with the concentrates ranges from 1 to 3 gallons per ton, depending somewhat on the nature of the ore. This plant has proven a remarkable success, ore carrying only one-tenth of one per cent copper having been concentrated 30 into 1, with a saving of 90%, giving concentrates of 2.7% in copper tenor. Without question the process is remarkably well adapted to the saving of slimes hitherto lost by even the best forms of modern concentrating tables. The plant requires the services of only 5 men per 10-hour shift, the machinery operating continuously and automatically. The concentrator will probably be doubled or trebled in size in the near future.

Le Roi No. 2 ores are shipped to the Northport smelter for reduction. Efforts have been made to consolidate this company with the Le Roi Mining Co., Ltd, but apparently negotiations have been dropped. For the fiscal year 1902 production was 3,001,027 lbs. of refined copper, 82,548 oz. of silver and 32,435 oz. of gold, of the gross value of $1,068,916, giving an average return of $16.89 per ton of ore. Mining costs were $5.02 and smelting costs $7.87, leaving a mining and smelting profit of $4 per ton. With the aid of the new Elmore plant the company should be able to earn substantial profits.

LE ROY MINING CO. **MEXICO.**

Office: Pilares de Teras, Sonora, Mex. Lee Benton, manager. Ores carry silver, gold and copper. Property is in process of development, with a fair force.

LEAD KING MINE. **COLORADO.**

Mine office: Crystal, Gunnison Co., Colo. T. P. Lamoy, operator, under lease, shipping about 100 tons ore monthly that averages 25% zinc, 9% copper, 8% lead and 20 oz. silver in smelter.

LEEDS COPPER CO., LTD. **QUEBEC.**

Had offices at 11, Bloomfield St., London, E. C., England, and a mine at Broughton Station, Beauce county, Quebec. Letter returned unclaimed.

LEIGHTON-GENTRY COPPER CO. **WYOMING.**

Office: Rawlins, Carbon Co., Wyo. J. E. Osbourne, president; Will Reid, secretary.

LENA MINING CO. **NEW MEXICO.**

Letter returned unclaimed from former mine office, Lordsburg, N. M.

LENORA COPPER MINING CO. **BRITISH COLUMBIA.**

Mine office: Duncans, Vancouver Island, B. C. Mine is located on Mt. Sicker. Also has a smelter at Crofton, Vancouver Island, B. C., operating a narrow-guage railroad between the mine and smelter. Ore body is 30′ to 40′ wide, with strong gossan capping, ore apparently occurring in lenses. Company has been in trouble financially, but the property is regarded as valuable.

LENORA MINING & MILLING CO. **UTAH.**

Office: care of P. C. Evans, secretary, Salt Lake City, Utah. Mine office: Milford, Beaver Co., Utah. Organized December 19, 1903. Miles L. Burns, president; J. D. Carpenter, general manager. Lands, 9 claims, known as the Lenora group, in Beaver county, Utah.

LENORA-MT. SICKER COPPER MINING CO. BRITISH COLUMBIA.

Office: Victoria, B. C. Mine office: Mt. Sicker, Vancouver Island, B. C. W. Buxton, superintendent. Property adjoins the Tyee, and is opened by tunnels. Average assays of upwards of 25,000 tons of ore gave returns of 7.95% copper, 3.57 oz. silver and 0.17 oz. gold per ton. About one-third of the production is first-grade ore, the second-grade ore carrying about 2% to 2.5% copper, with trifling values in gold and silver. Ore body is apparently of large size. Mine has direct connection with the Northwest Smelting Company's works at Crofton, to which ore is shipped. Property is regarded as valuable.

MINAS LAS LEONORA Y HUERTA. MEXICO.

Office: Apartado 16, Aguascalientes, Mex. Mine office: Villanueva, Zacatecas, Mex. Employs 150 men. G. M. Daniel, general manager; J. M. Daniel, Jr., superintendent and engineer; Manuel Varila, mine superintendent. Lands, 100 acres, also 500 acres of miscellaneous lands, in the Jalpa district, showing a fissure vein in porphyry, of 10′ average width, carrying argentiferous galena, argentite, malachite and azurite, with clay gouge, giving average returns of about 5% copper, 10% lead, 200 oz. silver and 29 miligrams gold per ton. Has shafts of 300′ and 1,000′, with about one mile of underground openings. Was opened by the Spaniards about 1820, reopened 1883. Has steam power and concentrator with 1 crusher and 12 planillas, for treating low-grade ores. Concentrates and smelting ores are shipped 75 miles by burros to the plant of the American Smelting & Refining Co. at Aguascalientes. Company plans sinking shafts, developing lower levels, adding air drills and reopening properties formerly abandoned, during 1904.

LERIDA COPPER MINES, LTD. SPAIN.

In voluntary liquidation. A. R. Norbert, liquidator, 24, Budge Row, London, E. C., England,.

SOCIEDAD ANONIMA MINERA BELGA DE LOS COBRES DE LERIDA Y GRANADA. SPAIN.

In liquidation. Former offices: Blvd. Anspach, 64, Brussels, Belgium. Mining lands are in province of Lerida and Granada, Spain.

LESLIE COPPER MINING CO. IDAHO.

Supposed to have copper claims somewhere west of Saltese, Idaho, but letter returned unclaimed from that place.

LEVANT MINING CO., LTD. ENGLAND.

Offices and mine: St. Just, Cornwall, England. A cost-book company with 2,385 shares. T. R. Bolitho, chairman; Maj. R. White, secretary. Mine produces tin and copper, mainly the former, and has been continuously worked since 1820.

LEVIATHAN MINE. CALIFORNIA.

An idle property, 10 miles east of Markleeville, Alpine Co., Cal. Ore occurs as lenses, in porphyry. Has tunnels of 400′ and 700′.

LEXINGTON MINE. **MONTA**

Office: care of Georges de la Bouglise, owner, 80, Rue Taitbout, P
France. Mine office: Butte, Silver Bow Co., Mont. Is an old gold-si
mine, lying just west of the Cora mine of the United Copper Co. M
shaft, 1,700′. From depth of 1,400′ to bottom there is a 30′ vein v
granitic gangue, carrying ledges or stringers of sulphide ore averaging
to 4% copper.

LIBERTY COPPER MINING & MILLING CO. **MARYLA**

Mine office: Libertytown, Frederick Co., Md. Capitalized at $2,000,
Thos. E. Ludlam, president; M. C. Stafford, secretary; W. J. Ayres, supe
tendent. Owns the old Liberty mine, now idle, which has a variety of o
including chalcocite, tenorite, tetrahedrite, bornite and malachite.

LIBERTY MINING & SMELTING CO. **ARIZO**

Mine office: Tucson, Pima Co., Ariz. Wm. R. Wemple, manager. O
carry silver, lead and copper. Has gasoline power.

LIBIOLA COPPER MINING CO., LTD. **ITA**

Offices: 16, Leadenhall St., London, E. C., England. Mine office: Se
Levante, Liguria, Italy. Kenneth Haweis James, chairman; W. S. Bartl
secretary; Robt. H. Craven, mine manager. Reorganized 1888, with capi
£252,000, shares £5 par. Has paid dividends of £4 1s. 6d. to close of 19
dividends being 2s. 6d. annually, in 1901 and 1902 and 1s. interim in 19
Company has a heavy share interest in the Crueeuen silver-lead mine, S
dinia, now idle, and owns the Libiola copper mines in Liguria, north
Italy. Ore of latter is mainly low-grade chalcopyrite, occurring as ve
in serpentine and diabase, the mines showing large bodies of ore. Prope
was discovered and worked by the Romans and was reopened in 1867. P
duction in 1902 was 4,564 long tons of ore, averaging 4.75% copper, equi
lent to 485,385 lbs. or refined copper, and 22,727 tons of iron pyrites aver
ing 47.5% sulphur. This property, while low in grade, has extensive
bodies, and by careful management is made to yield fair profits.

SOCIETA ANOMINA PER L'ESERCIZIO DELLA MINIERA DE LIBIOLA. **ITA**

See Libiola Copper Mining Co., Ltd.

SOCIETE DES MINES DE LA LIENNE. **ITA**

Mine offices: Alagna and Riva, Circondario di Varallo, Novarra, It
Ore is medium grade chalcopyrite. Was working on a limited scale
last accounts.

SOCIETE LIGURE RAMIFERA. **ITA**

Mine office: Casarza, Genoa, Italy. Mines include the Fontane
Rio Albareta, Rio Monticelli and Rio dei Fichi. Ore is chalcopyrite,
quartzose gangue. Mines are producing on a limited scale.

LILLIE MINING & MILLING CO. **COLORAD**

Mine office: Idaho Springs, Clear Creek Co., Colo. F. F. Reed, sup
intendent. Ores carry gold, silver, lead and copper. Has steam po
and employs 10 men.

LILYAMA MINE. **CALIFORN**

Office: care of Robt. Crocker & Co., Placerville, Cal. Lands, 240 ac unpatented, in El Dorado Co., Cal., 11 miles from Auburn. Ores, mainly sulphides, occuring as lenses in limestone, lying between granite and quartz-porphyry. Has four tunnels and a prospecting shaft.

LIMA COPPER MINING SYNDICATE, LTD.

Offices: 8, Union Court, Old Broad St., London, E. C., England. J. Harris, chairman; T. Simpson, secretary. Location of property, if any, unknown.

LIME CREEK COPPER CO. **ARIZONA.**

Office: 5 Creighton Bldg., Phoenix, Ariz. Capitalization $500,000. A. J. Edwards, president; J. D. Marlar, secretary; J. W. Monday, superintendent. Lands, 480 acres, called the Copper Top mine, lying 60 miles northeast of Phoenix, some distance from a railroad, and held on bond and lease. Has a considerable ore body, giving assays of 5% to 40% copper and $8 to $10 gold per ton, and is developed by several shafts and tunnels. Has a 10-ton smelter at the mine and a 30-ton smelter at Alhambra, 6 miles west of Phoenix. Employs 20 to 30 men, and enjoys good local standing.

COMPANIA LIMITADA. **CHILE.**

Operates the Fundicion Templeman mine, opened in 1897, in department of Antofagasta, Chile, producing therefrom about 1,500 tons of refined copper yearly.

LINARES MINING SYNDICATE, LTD. **SPAIN.**

Mine office: Linares, Jaen, Spain. S. Moos, manager. Organized early in 1903 to exploit lead, copper, zinc, iron and coal properties in the vicinity of Linares. Company proposes constructing a large warehouse and shipping pier at Almeria, Spain.

LINCOLN MINE. **UTAH.**

Mine office: Minersville, Beaver Co., Utah. Gus Stoney, superintendent. Ores carry silver, lead and copper. Mine is opened by shaft, and has steam power.

LINCOLN COPPER DEVELOPMENT CO.

Office: 326 Post St., San Francisco, Cal. Location of property, if any, not learned.

LINCOLN COPPER MINING CO. **ARIZONA.**

Office: 321 Spruce St., Aurora, Ills. Capitalization $3,000,000, shares $1 par. Lands, 42 claims, area about 850 acres, in the Sierrita Mountains, near Tucson, Pima county, Arizona. Said to have a 100-ton smelter.

LINCOLN MINING & MILLING CO. **COLORADO.**

Mine office: Idaho Springs, Clear Creek Co., Colo. J. M. Dumont, superintendent. Ores carry gold, silver, copper and lead. Has steam power and 15-stamp mill.

MINA LINEA DIVISORIA. **CHILE.**

Mine office: Chañaral, Atacama, Chile. Braniff y Roldan, owners. Employs about 25 men.

LINEDALE WEST CHILLAGOE, LTD. **AUSTRALIA.**

Offices: 47, Queen St., Melbourne, Australia. Mine office: Arbouin, Chillagoe, Queensland, Australia. Capital £16,500, shares £5 par. C. W.

Chapman, chairman; Thos. Rollason, secretary; E. Reeves, mine manager. Lands, 19 claims, area 440 acres, in the Herberton district, showing a 7′ vein, with a 3′ pay-streak carrying 20% copper, 10 oz. silver and 2 dwts. gold per ton, on which a limited amount of development has been secured. Operations were hampered by lack of funds at last accounts.

LION COPPER MINING CO. **ARIZONA.**

Office: 110 So. Broadway, Los Angeles, Cal. Mine office: Stoddard, Yavapai Co., Ariz. Employs 8 men. Organized February, 1903, under laws of Arizona, with capitalization $2,500,000 shares $1 par. Chas. Matthews, president; O. A. Cox, secretary and treasurer; Henry Reifsnyder, general manager. Lands, 12 claims, area 240 acres, in the Agua Fria district. Country rocks are limestone, quartzite and dioritic porphyry, showing numerous veins carrying oxide, carbonate and sulphide ores giving average assays of 24% copper, and opened by shafts of 50′, 100′ and 200′. Has gasoline power and is 6 miles from nearest railroad. Company plans sinking main shaft to about 350′ and opening from bottom by drifts and crosscuts.

LION GOLD MINING & MILLING CO. **COLORADO.**

Mine office: Silverton, San Juan Co., Colo. Chas. Newman, superintendent. Ores carry gold, silver and copper. Has steam power and employs about 20 men.

LITHGOW COPPER SMELTING & REFINING WORKS. **AUSTRALIA.**

Office: Equitable Bldg., Sydney, N. S. W., Australia. Works office: Lithgow, N. S. W., Australia. N. Longworth, manager. Is the most important copper smelting plant in Australia, works including furnaces of 400 tons daily capacity, and an electrolytic refining plant. Employs about 300 men.

LITTLE BAY MINE. **NEWFOUNDLAND.**

An idle mine on Little Bay, Nfld. Opened 1878, closed 1892. Has a 1,350′ main shaft and small smelter. Was a considerable producer when operated.

LITTLE GIANT MINING, MILLING & SMELTING CO. **WASHINGTON.**

Office: Spokane, Wash. Mine office: Marcus, Stevens Co., Wash. J. B. Reynolds, superintendent. Has auriferous and argentiferous copper ores, with steam power, and employs about 10 men.

LITTLE MATTIE MINING, MILLING & POWER CO. **COLORADO.**

Mine office: Idaho Springs, Clear Creek Co., Colo. F. V. S. Leebrick, superintendent. Ores carry gold, silver, lead and copper. Has steam and water power and 20-stamp mill, employing about 40 men.

LIVE OAK COPPER MINING & SMELTING CO. **ARIZONA.**

Office: 438 Broome St., New York. Mine office: Globe, Gila Co., Ariz. Organized under laws of Arizona, with capitalization $1,200,000, shares $1 par. F. J. Kaldenberg, president; Forest J. Kaldenberg, vice-president and secretary; W. G. Augustin, treasurer.

LIVERMORE GOLD & COPPER MINING CO. **WYOMING.**

Organized May, 1902, with capitalization $1,000,000, to take over Cumberland, Empire, Flying Dutchman, and Eureka claims, in vicinity of Laramie, Wyoming. Letters to Laramie returned unclaimed.

MINAS LLANOS BLANCOS Y LOS PLATOS. **CHILE.**

Mine office: Tamaya, Tongoya, Ovalle, Chile. Opened 1893. Main shaft 250′ deep. Supposed to be idle.

"LLOYD" COPPER CO., LTD. **AUSTRALIA.**

Offices: 195A, Winchester House, London, E. C., Eng. Mine office: Burraga, County Bathurst, New South Wales. Employs about 350 men. Alexander Creighton Arthur, chairman; W. H. Carnould, acting general manager; L. Malleson, secretary. Registered May 9, 1899, with capital £250,000; debentures authorized, £50,000, first mortgage. Lands, 318 acres freehold and 375 acres leasehold, in the Bathurst district. Ore is slightly argentiferous chalcopyrite, with quartzite gangue, occurring in fissures traversing acid diorite. Main shaft is 1,700′ in depth and mine, which was opened 1877, is quite extensively developed. District is arid and operations are occasionally suspended from lack of water, although the mine has a storage dam of 85,000,000 gallons capacity, sufficient for about nine months' supply. The reduction plant, built in 1901, at a cost of £32,000, includes a concentrator and 50-ton smelter with reverberatory furnace, also a converter plant added in 1903. Property has a good mining equipment, including an electric plant, and burns about 60,000 cords of wood yearly. Production of refined copper for one year ending June 30, 1902, was 1,228 long tons, from 37,041 tons of ore and in 1903 production ranged from 125 tons to 200 tons monthly. The mine has been extensively opened and shows enormous bodies of medium-grade ore, with a considerable amount of high-grade ore in sight, and is one of the most promising of Australian copper mines.

LOCH WINNOCH MINE. **SCOTLAND.**

At Loch Winnoch, Renfrewshire, Scotland. An old property, about 9 miles from Glasgow, idle for many years.

LOG CABIN GOLD & COPPER CO., LTD. **ONTARIO.**

Office: 1103 D. S. Morgan Bldg., Buffalo, N. Y. Has gold claims near Mine Centre, Rainy River district, Ontario, also sundry copper claims in Ontario. Capitalization $3,000,000, shares $1 par. Cannot be learned that company is doing any work.

LOMA VERDE COPPER CO. **ARIZONA.**

Office: 316 Bradbury Bldg., Los Angeles, Cal. Mine office: Tucson, Pima Co., Arizona. Organized 1901, under laws of Arizona, with capitalization $1,000,000. T. C. Paxton, president and general manager; E. F. Campbell, secretary; L. D. Lewis, superintendent; N. E. Isbell, engineer. Lands, 16 claims, area 320 acres, 16 miles east of Tucson, showing fissure veins carrying ore assaying up to 23% copper and $5 gold per ton, developed by 3 shallow shafts and 3 short tunnels, main shaft being 300′. Said to contemplate installation of a 50-ton smelter. Has gasoline power and paid a small dividend in 1903, closing down shortly after.

LOMAGUNDA DEVELOPMENT CO., LTD. **RHODESIA.**

Offices: Salisbury House, London, E. C., England. Capital, nominal,

£250,000: issued, £220,500. J. Secar, chairman; H. E. Jones, consulting engineer; E. Phillips, secretary. Lands, 500 claims, at Lomagunda, Mashonaland, Rhodesia, on several of which promising copper indications have been found.

LOMBARD COPPER CO. **OREGON.**

Organized at Baker City, Oregon, July 19, 1902, by F. L. Evans, H. C. Pearson and W. G. Main, with capitalization $2,000,000. Letters returned unclaimed from Baker City.

LOMBARD GOLD & COPPER MINING CO.

Letters returned unclaimed from former office, 316 McCornick Bldg., Salt Lake City, Utah.

LONDON-COLORADO PROPERTIES, LTD. **COLORADO.**

Mine office: Central City, Gilpin Co., Colorado. Has bond and lease on the Pierce mine, in Central City, which makes a promising showing of copper ore.

LONE PINE MINING CO. **ARIZONA.**

Office: 20 Broad St., New York. Succeeded to the assets and reputation of the notorious Arizona, Eastern & Montana Co. Was promoted by the joint efforts of L. E. Pike & Co., of unsavory reputation, and Dr. R. C. Flower, well known to the courts of the United States and Mexico. Said to have defective title to lands claimed.

LONE STAR MINE. **ARIZONA.**

Mine office: Solomonville, Graham Co., Ariz. C. B. Spaulding, superintendent. Main shaft is about 400′ deep.

LONE STAR MINE. **ARIZONA.**

Mine office: Williams, Coconino Co., Arizona. Rounseville & Hardesty, owners.

LONE STAR COPPER CO. **TEXAS.**

Was developing property near Henrietta, Clay Co., Texas, in 1899. Letters returned unclaimed from Henrietta.

LOOKOUT GROUP. **ALASKA.**

Office: care of H. H. Wakefield, Ketchikan, Alaska. Lands, 6 claims, showing a good body of medium-grade ore, at Niblack Anchorage, Prince of Wales Island, Alaska.

COMPANIA MINERA LORETO Y PROVIDENCIA. **MEXICO.**

Mine office: Candamena, Chihuahua, Mexico. Owned by Jesus Poyral, Rascon Bros. and E. R. Bones. Ores carry silver, copper and lead. Has a 500′ main shaft and 900′ tunnel, with water power, 5-stamp mill and one-ton smelter, employing about 100 men.

LORRAINE COPPER MINING CO. **WASHINGTON.**

Office: Hoquiam, Wash. Mine office: Keller, Ferry Co., Wash. Organized April 13, 1900, under laws of Washington, with capitalization $1,500,000, shares $1 par. Owen Jones, president; A. G. Rockwell, secretary; Fred J. Chamberlain, general manager. Lands, 22 claims, area 422 acres, also a 20-acre millsite, in two groups, the Wilmot group being in the Sans Poil mining district of Ferry county, and the Lorraine group in the Carbon River strict of Pierce county, Washington. Properties show 7 ore bodies, as sures in granite on the Lorraine group and contact veins between porphyry d schist on the Wilmot group. Contact veins are 4' to 6' wide and give erage assays of 6.5% copper, 40 oz. silver and $4 gold per ton, on the ilmot group, and fissure veins give 20% copper, 5 oz. silver and $10 gold ton, on the Lorraine group. The Wilmot group shows malachite and rite near surface, with chalcocite, bornite, and chalcopyrite at depth. e Lorraine group shows bornite and chalcopyrite. Developments on the raine include 4 shafts, deepest 100', and 8 tunnels, 3 longest being ', 472' and 630'. Properties have 2,016' of underground openings and npany plans continuing active development.

S ALAMOS MINING & MILLING CO. MEXICO.

Office: care of Dr. Finis E. Yoakum, president, Los Angeles, Cal. Mine e: Alamos, Sonora, Mex. Said to have a very encouraging showing of iferous copper ores.

T GULCH COPPER CO.

Letter returned unclaimed from former office, 218 So. Broadway, Los geles, California.

PANIA EXPLOTADORA DE LOTA Y CORONEL. CHILE.

Office: Valparaiso, Chile. Mine office: Chañaral, Atacama, Chile. tiago Collins, manager. Owns and operates mines in different parts Chile. The Descubridora mine at Carrizallio, Chañaral, was opened 1850 l is about 650' deep. The Lota mine, opened 1856, in the department of taro, and the Maitenes, opened 1844, in the department of Santiago, among the more important. The company also owns sundry coal mines. elter and mines are equipped with steam and electric power, and the lter has a converter plant and refinery. Production is about 12,000,000 of refined copper yearly, shipped to Europe as Chile bars and ingots.

TUS GROUP. COLORADO.

Mine office: Russel Gulch, Gilpin Co., Colo. L. Sternberger, superindent. Ores carry gold, silver and copper. Has steam power.

IA DO LOUZAL. PORTUGAL.

Office: 4, Praca dos Remolares, Lisbon, Portugal. Mine office: Louzal, ndola, Alemtejo, Portugal. Is the property of a syndicate of 6 owners. hor Waldemar d'Orey, general manager; Joaquin Chaves, mining captain. ds, 1 square kilometre, showing 6 known ore bodies, largest with maximum lth of 25 metres, other dimensions unknown, giving returns of 0.5% to % copper and 1.2 oz. silver per ton with traces of lead, zinc and gold, inly from cupriferous iron pyrites, with occasional oxides and a little ive copper. Has 4 shafts, of 12 to 30 metres depth, and a 300-metre nel, with about 1,000 m. of underground openings, showing about 3,000,000 s of ore. Property was discovered and opened by the Romans and pened in 1901. Property is idle, awaiting construction of the Lado nch railway, which should be completed in 1905.

V DIVIDE COPPER MINING CO. CALIFORNIA.

Office: care of John Murray, president, Crescent City, Cal. Owns the Alta, Occidental and Copper Hill groups, in Del Norte county, Califor Several different veins have been opened to some extent, these showing oxi carbonate and sulphide ores of good grade.

LOWER MAMMOTH MINING CO. **UTA**

Office: Salt Lake City, Utah. Mine office: Mammoth, Juab Co., Ut Simon Bamberger, manager. Has steam and electric power, and empl about 125 men. Ores treated in 1902 averaged 3% copper, 52 oz. sil and 85 cents gold per ton.

GUSTAVE LOZANO. **SAN. SALVADOR, C.**

Mine office: Chalatelango, San Salvador, Central America. Produ copper, gold and silver. Has steam power, and employs about 100 m

LUCERO COPPER MINING CO. **NEW MEXIC**

Letters returned unclaimed from former office, Mora, Mora Co., N.

LUCKY VERDE COPPER CO. **ARIZON**

Office: 523 Douglas Bldg., Los Angeles, Cal. Mine office: Jero Yavapai Co., Ariz. Company cramped for funds and will probably lo lands early in 1904.

LUCY L. MINING & MILLING CO. **UTA**

Clyde H. Wilson, superintendent; Frank L. Wilson, secretary and trea urer. Property is in the Deep Creek district of Juab county, Utah, an is said to present an exceptionally good surface showing of rich copper or

LUDWIG COPPER MINING CO. **NEVADA**

Mine office: Yerington, Lyon Co., Nev. A. Pugh, lessee and operator Ores carry copper, gold and silver. Has steam power and a 30-ton smelter.

KUPFERBERGWERK LUDWIGSDORF. **GERMANY.**

Mine office: Ludwigsdorf, Schlesien, Germany.

LUKE CREEK GOLD-COPPER MINING CO. **BRITISH COLUMBIA.**

Offices: 435 Temple Court, Minneapolis, Minn. Mine office: Marysville, Fort Steele division, East Kootenai, B. C. Capitalization $1,000,000, shares $1 par. S. D. Pompelly, president and general manager; E. D. Barcalow, secretary. Lands, 2 claims, area 110 acres, undergoing development at last accounts.

LUSTRE MINING CO. **MEXICO.**

Office: Pittsburg, Pa. Mine office: Indé, Durango, Mex. Owns the Mina Magistral. Ore is an argentiferous and slightly cupriferous iron pyrite, carrying 0.5% copper and about $10 silver per ton.. Company has developed a large ore body but had not secured a satisfactory process of reduction at last accounts.

LYELL COMSTOCK MINE. **TASMANIA.**

Supposed to have consolidated with the Tasman Lyell. Property carries a large body of ore, averaging about 4.5% copper, which is under the present limits of successful mining and smelting practice in Tasmania, but the mine may become valuable in time. Employs about 25 men and has rail connections with the North Lyell smelter, at Crotty, Tasmania.

LYELL PEAKS MINE. **TASMANIA.**

In the Mt. Lyell district of Montague county, Tasmania. A prospect only.

LYELL PIONEER CONSOLIDATED. **TASMANIA.**

A prospect in the Mt. Lyell district of Montague county, Tasmania. Idle at last accounts.

LYELL THARSIS MINING CO. **TASMANIA.**

Offices: Finsbury House, London, E. C., Eng., and 31, Queen St., Melbourne, Australia. W. Orr, chairman; W. K. Pale, mine manager; E. Habben, secretary in London; J. Potts, secretary in Melbourne; Hon. N. J. Brown, agent in Tasmana; J. E. Elliott, superintendent. Capital, nominal, £150,000; issued, £123,000. Small dividends were paid, 1899-1901. Lands are in the Mt. Lyell district, Montague county, Tasmania. Mine was opened 1897, and largest annual product was about 1,000 tons of refined copper, from ores averaging 3.5% to 5% smelter returns. Original ore body apparently is exhausted. Company was doing diamond drilling, with a force of 6 men, at close of 1903.

LYMNI COPPER MINING SYNDICATE. **CYPRUS.**

Offices: 32, Victoria St., London, S. W., Eng. Mine office: Limassol, Cyprus. Employs about 75 men. Organized 1897, with capital, nominal, £20,000; issued, 15,000 shares, of which 12,264 are fully paid; 736 paid 15s., and 2,000 paid 5s. L. P. Ford, chairman; Thos. Creswell, F. I. S., secretary; Chas. Christian, mine manager. Lands, 30 square miles, in the Bellathousa district of Colis, Chrysokhow, Cyprus. Ore occurs as lenses, largest having a width of 400′ and length of 1,400′. Estimated average ore values is 9% to 10% copper and 3 dwts., silver per ton, from bornite and chalcopyrite. Is developed by 7 shafts of 150′ to 300′ depth, and a 2,100′ tunnel. Ore formation apparently is continuous for 3 miles. Mine is not permanently equipped and estimates of values are excessive.

LYNGENFJORD KOBBERVAERK. **NORWAY.**

Owned by Norwegian Copper Mines, Ltd.

LYNN CREEK COPPER-GOLD CO., LTD. **BRITISH COLUMBIA.**

Office: 419 Hastings St., Vancouver, B. C. Mine office: Lynn Creek, Vancouver Island, B. C. Organized 1901, under laws of British Columbia, with capitalization $300,000, shares $5 par. G. L. Allan, president and treasurer; W H. Pegram, secretary; W. Thos. Newman, general manager; G. Richardson, superintendent. Lands, 6 claims, area 200 acres, 8 miles from Vancouver, in the New Westminster district, showing 6 veins, of which 3 range from 5′ to 40′ in width, giving assays of 8.9% copper, 3 oz. silver and $1 gold per ton. Also has a 4′ to 6′ vein of zinc ore, opened by 2 tunnels giving a back of 800′ to 1,000′. Mine said to have a large amount of ore in sight and can ship ore by water to smelters at Crofton, Ladysmith and Van Anda. Mine supposed to be under bond and lease to a syndicate headed by Thos. Jones, of Iola, Kansas.

LYONS KYLE GOLD MINING & MILLING CO. **COLORADO.**

Mine office: Central City, Gilpin Co., Colo. Wm. Woods, superintendent. Operates the Tucker mine, carrying gold, silver, lead and copper. Has steam power, 5-stamp mill and 50-ton concentrator, employing about 25 men.

McCABE MINE. **ARIZONA.**

Mine office: McCabe, Yavapai Co., Ariz. Primarily a gold mine, but carries small gold values. Present milling capacity, 80 tons, is to be increased to 200 tons daily.

McCABE EXTENSION MINING & MILLING CO. **ARIZONA.**

Office: Prescott, Ariz. Mine office: McCabe, Yavapai Co., Ariz. Reese M. Ling, president; E. R. McDowell, secretary; John H. Farrell, superintendent. Lands, several claims adjoining the McCabe mine, on which a 300′ shaft has been sunk.

McCOY GROUP. **ARIZONA.**

Office and mine: Globe, Gila Co., Ariz. C. E. Taylor, owner.

McKINLEY MINING & SMELTING CO. **NEVADA.**

Mine office: Ely, White Pine Co., Nev. Capitalization $1,000,000. M. C. Barber, president; F. E. Fitch, vice-president; Dix W. Smith, secretary; A. J. Hazeltine, treasurer; W. N. McGill, superintendent. Lands are the Aurora group of 5 claims, formerly worked as a gold mine, but carrying copper ores in lower workings. Has a 300′ main shaft and about 1,000′ of drifts. First payment on property was made in March, 1903.

MAADEN-KENI MINES. **TURKEY.**

Mine office: Baibourt, Trebizond, Turkey in Asia. Are operated in a small way by a Greek syndicate.

MACKEY-BURROUGHS MINING CO. **COLORADO.**

Mine office: Central City, Gilpin Co., Colo. Ores carry gold, silver and copper. Has steam power and employs 15 to 20 men.

MACKINAW MINING & MILLING CO. **WASHINGTON.**

Property, in Snohomish county, Washington, gives fair assay values in copper and nickel.

MADISONIAN MINE. **MONTANA.**

Mine office: Norris, Madison Co., Mont. Levi Z. Leiter, owner, Chicago, Ill.; E. J. Trerise, superintendent. Ores carry gold, silver and copper. Has steam power, concentrator and 60-ton cyanide plant, employing about 25 men.

MAGENTA GOLD MINING CO. **COLORADO.**

Mine office: Granite, Chaffee Co., Colo. C. E. Barrie, superintendent. Has gold, silver and copper ores, and steam power. Employs about 25 men.

COMPANIA MINERA DEL MAGISTRAL. **MEXICO.**

Office and mine: Magistral, Chihuahua, Mex. Employs about 200 men. Enrique C. Creel, owner; John Weir, manager. Lands, 35 pertenencias, area 86 acres. Has a 300′ main shaft. Equipment includes steam and gasoline power and a 150-ton smelter.

MAGISTRAL MINING CO. **MEXICO.**

Mine office: Ameca, Jalisco, Mex. A. Brambille, manager. Was employing a small force, on development work, at last account.

MAGNETAWAN MINING CO. **ONTARIO.**

Office: care of R. S. Hews, secretary, Connellsville, Pa. Mine office: Burks Falls, Parry Sound district, Ontario.

MAGNOLIA GOLD & COPPER CO.

Office: Seattle, Wash. Location of lands not learned.

MAGPIE GOLD & COPPER MINING CO. **WYOMING.**

Mine office: Riverside, Carbon Co., Wyo. Lands, on south fork of Encampment river, near Riverside, Carbon Co., Wyo.

MAINE & MONTANA COPPER CO.

Office: Ft. Fairfield, Me. Mine office: Basin, Jefferson Co., Mont.

COMPANIA MINERA DE MAIPU. **CHILE.**

Office: Santiago de Chile. Operates El Volcan mine, opened 1884, in the department of Victoria, Chile. Ore occurs in a fissure vein, and is self-fluxing, giving average smelter returns of about 6% copper. Mine has a very intelligent management, and is securing excellent results. Costs of mining and smelting are very low, net cost of copper delivered in London averaging about £30 per long ton. Annual production is about 1,500 tons of refined copper.

MAJDANPEC MINES. **SERVIA.**

Mine office: Majdanpec, Servia. Are producers on a limited scale, making copper by lixiviation and cementation.

MAJESTIC COPPER MINING & SMELTING CO. **UTAH.**

Office and mine: Milford, Beaver Co., Utah. Employs about 80 men. Organized 1900, under laws of Colorado, with capitalization $6,000,000, shares $10 par. Was practically reorganized December, 1903. W. B. Mucklow, president; Dr. Loring R. Loomis, secretary; W. H. Alexander, general manager; Josiah Osborne, superintendent; M. M. Mays, smelter superintendent; Geo. E. Keith, Harrison G. Howe, Howard G. Bradley, L. G. Loomis, Jas. H. Knight and Chas F. Street, executive committee and voting trust. A considerable portion of the stock issued has been pooled for five years from Oct. 1, 1903. Company is supposed to be negotiating a $1,000,000 loan.

Lands, 120 claims, area 2,450 acres, also an 80-acre smelter site and 1,100 acres of miscellaneous lands, located in 5 districts of Beaver county, Utah, and showing about 100 ore bodies in 20 or more different groups of mines and prospects. In addition to copper the ores carry gold, silver, platinum, lead, cobalt, bismuth, vanadium and uranium. Copper ores include all of the principal oxides, carbonates and sulphides, also occasional native copper and many of the rarer copper minerals, ranging from 2% to 85% in copper tenor, average value of ore being estimated by company at 12% copper, 12 oz. silver and $3 gold per ton, with large percentages of lead, but estimates are probbly too high. There are 18 shafts of 100′ to 400′ depth, also many tunnels and innumerable test-pits. Underground development is about 30,000′, and ore in sight is estimated at 1,000,000 tons, with about 500,000 tons blocked out for stoping. These figures are also much overestimated. The lands include 8 separate groups of mines, some of which were formerly worked for silver, but the silver-copper ores at and near surface gave way to copper-silver ores at depth, all ores being more or less auriferous.

The O. K. is the principal mine of the company. Selected shipment of [illegible] tons of O. K. ore gave net returns of $95,000, a shipment of 258 tons in [illegible] giving smelter returns of [illegible] copper, 7.5 oz. silver and $3.80 gold per ton. The O. K. group has 7 claims, opened by a 3-compartment main shaft of 400', to be sunk 200' deeper, showing a vein ranging up to 28' width, with considerable development on the 300' and 400' levels. Has also an undeveloped ore body apparently about 250' wide, which is a stockwerk with veins and stringers carrying high-grade ores.

The Old Hickory group of 9 claims, with a gossan capping about 250' wide, is opened by a short tunnel and about 50 pits and shafts, deepest 212', showing ores carrying 1% to 5% copper, with gold and silver values estimated at $2 to $4 per ton, from a vein 40' to 200' wide.

The Harrington-Hickory group of 25 full and fractional claims has about 12,000' of development work, with 40 pits and shafts in ore, the two deepest being about 400' each, with a new 3-compartment main shaft. This group shows numerous fissure veins intersected by cross-veins, both approximately vertical, and in addition has a series of bedded veins dipping approximately 30° to 35°, giving three separate intersecting systems of ore bodies. Principal values are in lead, ores giving assays of 2% to 3% copper, 25% to 50% lead and up to 50 oz. silver and $1 gold per ton.

The Vicksburg group of 4 claims formerly mined for gold, shows three 2' to 20' vertical fissures, with mineralized cross-veins, opened by numerous shallow pits and shafts, with a 2-compartment working shaft.

The Hoosier Boy group of 10 claims has a 250' vertical shaft in limestone, with auriferous and argentiferous copper-lead ores. The Larkspur group of 8 claims shows a mineralized zone of 60' to 75' width, in limestone, with a granite contact, carrying irregular bunches of high-grade ore. The Copperfield group of 17 undeveloped claims lies between the O. K. and the Old Hickory mines. Miscellaneous holdings include the Apex group of 4 claims adjoining the Old Hickory, and the Ben Harrison groups.

The mine has steam, gasoline and electric power, and an undeveloped water power on Beaver River, 35 miles distant, can be made to generate about 2,000 h. p. and transmit same electrically to the mine and smelter, at an estimated cost of $100,000.

The smelter, at Lewisville, 3 to 8 miles from the various mines, was built by the Colorado Iron Works Co. and has a sampling mill and two 250-ton copper furnaces and one 100-ton lead furnace, with Nesmith hot-blast stoves, which heat the blast to 800° Fahrenheit before entering the tuyeres. The smelter building is of steel frame, on stone foundations, and large enough to double the present furnace capacity if needed. The townsite of Lewisville was platted by the company. The mines and smelter are served by the Oregon Short Line railway.

The Majestic is a property of much more than ordinary promise, but it has been [illegible] managed. A. B. Lewis, the former president, is said to have [illegible] with the [illegible] sales of his personal holdings. The fiscal agents are said to have [illegible] commission from stock sales, [illegible] a legitimate organization. The company's credit has been greatly injured by indiscriminate borrowing and the corporation is said to have ended 1903 with a floating indebtedness of upwards of $225,000. The smelter was prematurely built, as the mines are not sufficiently developed to feed a 500-ton plant. The smelter was blown in late in 1903, and on a test run handled an average of 170 tons daily for 40 days, producing $62,500 worth of matte, claimed by the company to have been made at an average cost of $35,000, though it is probable that many items properly chargeable to operating costs were omitted to secure this paper profit. The ore, as treated, averaged 5.1% copper, 3.8 oz. silver and $1.20 gold per ton. Careful examination of the available data regarding this property and its flotation lead to the conclusion that while there has been no absolute dishonesty, the promotion had a number of questionable features. What the Majestic needs to make it the big mine that there is every reason to believe it can be made, is about $2,000,000 in cash, and a capable management that can devote its entire time and efforts to development and operation, rather than to the matter of financing the property by sales of stock.

EL MAJIN MINE. **MEXICO.**

Letter returned unclaimed from Hermosillo, Sonora, Mexico, with notation "unknown."

MALACHITE COPPER CO. **ARIZONA.**

J. F. Durlin, secretary. Supposed to have copper claims north of Williams, Coconino Co., Arizona.

MALACHITE COPPER-GOLD CO. **CALIFORNIA.**

Office: 209 Homer Laughlin Bldg., Los Angeles, Cal. Letter returned unclaimed from former mine office, Daggett, San Bernardino Co., Cal. Organized under laws of South Dakota, with capitalization $1,000,000, shares $1 par. S. A. Barrett, president; Dr. A. P. Hays, vice-president; Jos. B. Cook, secretary; W. E. Steadman, superintendent. Lands, 5 claims, area 100 acres, in the Ord district of San Bernardino county. Has a 165' shaft on a 34' vein carrying an 8' pay-streak said to assay 7.5% copper and $3 gold per ton.

MALAGON GROUP. **SPAIN.**

Mine office: Puebla de Guzman, Huelva, Spain. C. & J. Sundheim, owners; Wm. Guthrie Bowie, manager. Property is a group of government concessions showing many old workings and excellent outcrops. Owners contemplate giving the property a thorough test.

MALONEY-BLUE LEAD COPPER MINING CO. **SOUTH DAKOTA.**

Mine office: Sheridan, Pennington Co., S. D. R. M. Maloney, general manager. Capitalization $3,000,000. Ores carry gold, nickel and copper, latter in small percentages, in a vein stated to be 118' wide and opened by a 1,610' tunnel, with considerable drifting. Has steam power and has expended about $75,000 in development.

MAMMOTH MINE. **ARIZONA.**

Mine office: Dragoon, Cochise Co., Ariz. S. S. Campbell, superintendent, at last accounts. Has steam and gasoline power.

MAMMOTH MINE. **CALIFORNI**

Mine office: care of John G. Fletcher, superintendent, Kennett, Shas Co., Cal. Lands, 880 acres, having about 1,500′ of tunnels, showing a la body of medium-grade auriferous and argentiferous copper ore.

MAMMOTH COPPER CO.

Promoted by the notorious Wm. F. Wernse & Co., Bond and St Company, 421 Olive St., St. Louis, Mo. Location of property, if any, u known, and stock undoubtedly as worthless as the other shares put o by this firm of sharpers.

MAMMOTH COPPER MINING CO. **WYOMING**

Mine office: Saratoga, Carbon Co., Wyo. A. G. Epperson, superintendent, at last accounts.

MAMMOTH COPPER & SMELTING CO. **ARIZONA.**

Mine office: Red Rock, Pinal Co., Ariz. Lands, 41 claims, 25 miles from Red Rock. Main shaft is 400′, with about 6,000′ of underground openings and a 60-ton smelter. Mill test of ore is claimed to have averaged 16% copper and 22 oz. silver per ton, and company claims to have 54,000 tons of ore blocked out for smelting. Water supply is secured from wells. The mineralized belt in which the ore bodies occur ranges 300′ to 600′ in width, and is traceable about a mile.

MAMMOTH GOLD MINING CO. **COLORADO.**

Office: 1104 Marquette Bldg., Chicago, Ill. Mine office: Central City, Gilpin Co., Colo. W. H. Paul, superintendent. Ores carry gold, silver and copper. Has steam power and works 10 to 12 men.

MAMMOTH MINING CO. **UTAH.**

Mine office: Mammoth, Juab Co., Utah. Samuel McIntyre, Jr., superintendent. Produces gold, silver, lead and copper, latter as a by-product. Has steam power and 60-stamp mill. Employs about 150 men. Gross income from minerals produced in 1902 was $310,477.

MAMMOTH TUNNEL & MINING CO. **COLORADO.**

Office: 403-331 Fourth Ave., Pittsburg, Pa. Mine office: Silverton, San Juan Co., Colo. Makes very extensive claims in advertisements, but fails to substantiate its claims with details.

MAMMOTH HILL GROUP. **ARIZONA.**

Mine office: Safford, Graham Co., Ariz. E. F. Buss, superintendent, at last accounts.

MAMMOTH LODES MINING CO. **BRITISH COLUMBIA.**

An Oregon corporation, operating the Colorado group of claims in the Cascade Mountains, Yale & Cariboo district, British Columbia. Veins are said to run from 40′ to 250′ in width and to be traceable for more than two miles, and it is claimed that smelting tests have given 15% to 20% copper and $12 gold per ton, these figures being in themselves ample evidence that they are incomplete or grossly exaggerated. Such ridiculous claims carry their own refutation.

MANASSAS-GAP COPPER MINE, INC. **VIRGINIA.**

Office: 11 Broadway, New York. Mine office: Reager, Rappahannock

Co., Va. Idle, pending installation of plant. Organized Oct. 30, 1903, under laws of Virginia, as a reconstruction of the Carter Copper Co., with capitalization $999,000, shares $1 par. Lionel H. Leadam, president; Hon. John S. Wise, vice-president; Henry P. Porter, secretary; Geo. Brown Wright, treasurer and general manager; R. R. Crook, superintendent. Lands, 700 acres, freehold, including about 400 acres of timber land, in Fauquier county, Virginia, showing a volcanic formation carrying two contact veins between Cambrian sandstone and Silurian slates, veins ranging 3′ to 11′ in width and giving average assays of 5% copper, 10 oz. silver and $4 gold per ton, from malachite, bornite and chalcopyrite, associated with occasional native copper. Has about 600′ of underground openings. Two railroads are within 3 and 6 miles, respectively. Company plans installing a 50-ton furnace.

MANCAYAN COPPER SYNDICATE, LTD.

In voluntary liquidation. G. G. Walker, liquidator, 19, St. Swithin's Lane, London, E. C., England.

MANCHESTER ZINC & COPPER CO., LTD.

Voluntarily wound up April 15, 1901.

MANHATTAN GROUP. **ARIZONA.**

Supposed to be near Cave Creek, Ariz. Letters returned untlaimed.

MANHATTAN COPPER & GOLD MINING CO. **NEVADA.**

Office: 612 Dooly Blk., Salt Lake City, Utah. Mine office: Pioche, Lincoln Co., Nev. Organized July, 1902, under laws of Colorado, with capitalization $500,000, shares $1 par. A. B. Lewis, president; Joseph Henshaw, secretary; E. F. Freudenthal, manager. Property gives good assay values in both gold and silver, from ores secured by a limited amount of development work.

MANHATTAN COPPER MINING CO. **ARIZONA.**

Succeeded by Troy-Manhattan Copper Co.

MANICA COPPER DEVELOPMENT CO., LTD. **MOZAMBIQUE.**

Office: 123, Cannon St., London, E. C., England. M. F. Armstrong, chairman; J. S. Park, mine manager; W. E. Lane, secretary. Registered May 26, 1902. Capital, nominal, £150,000. Lands, sundry copper claims in Manicaland, Mozambique, Africa.

MANITOU MINING & MILLING CO. **COLORADO.**

Said to have copper claims near Bonanza, Saguache county, Colorado, but letter returned unclaimed from that point.

MANSFELD'SCHE KUPFERSCHIEFERBAUENDE GEWERKSCHAFT. **GERMANY.**

Mine office: Eisleben, Prussian Saxony, Germany. Present company was organized 1852. Mine was opened A. D. 1199 and has been worked extensively and almost continuously for more than 700 years. Principal ore is slightly argentiferous chalcopyrite, associated with limited quantities of nickel and cobalt ores, occurring as speise disseminated in very fine grains through the kupferschiefer, a fine-grained sandstone. The kupferschiefer lies nearly horizontally and ranges from 2′ to 3′ only in thickness, but covers nearly 200 square miles. Lying just below the kupferschiefer is an arenaceous shale carrying chalcopyrite and a limited quantity of copper carbonates. Sundry coal strata are found above the cuperiferous beds, and copper ore and coal are sometimes mined and hoisted through the same shaft. Owing to the thinness of the bed and the great age and extent of the workings, it is necessary for miners to work on their sides, bellies or backs, as in coal mines, wearing boards upon their bodies and thighs in order to protect themselves from the rocky floors. Owing to the great age and extent of the workings, the headings are usually 2 to 4 kilometres from the shafts, hence the actual mining is done under considerable disadvantages.

The smelter, near the mine, is equipped with Steinbeck's circular multiple-hearth automatic pyritic calciners, which use no carbonaceous fuel except for preliminary charges, the sulphur in the ore furnishing the necessary fuel thereafter. The copper secured in the smelting averages about 2.5%, the blister copper carrying nearly 0.5% silver. In addition to the mines and smelters the company has extensive industrial undertakings of a subsidiary and collateral nature, employing, all told, about 10,000 workmen. The mining and smelting operations for 1902 showed a small actual loss, but this was more than made up by the profits of other industries, leaving a net profit of upwards of 100,000 marks on the year's work. In 1903, owing to a better price for copper, substantial earnings were again secured. Annual production averages about 40,000,000 lbs. of refined copper.

MARAVILLA COPPER CO. ARIZONA.

Office: Providence, R. I. Mine office: Safford, Graham Co., Ariz. Wilbur H. Powers, president; Chas. B. Spaulding, superintendent. Lands, in the Gila range, about 12 miles from Solomonville. Mine has a 500′ main shaft showing a 5′ vein of sulphide ore, of high grade at bottom, carrying copper, silver and gold values, latter small. Is said to have a considerable showing of 8% to 10% sulphide ore.

MARBLE BAY MINING CO. BRITISH COLUMBIA.

Mine office: Van Anda, Texada Island, B. C. Alexander Brant, manager. Ores carry copper, gold and silver. Mine is opened by shafts, deepest 360′. Has steam power and 150-ton concentrator. Has ore bunkers on Sturt Bay, connected with the mine by a 2,125′ tram line. Employs about 60 men and secures a small but valuable production of argentiferous copper ore.

MARGUERITA MINE. CALIFORNIA.

An old property near Almaden, California, operated circa 1865.

MARICOPA COPPER MINES CO. ARIZONA.

Letters returned unclaimed from Wickenburg and Morristown, Arizona.

MARIETTA GOLD MINING CO. IDAHO.

Office: care of Lawson Investment Co., 60 State St., Boston, Mass. Organized under laws of Washington, with capitalization $1,000,000, shares $1 par. M. E. Lawson, president and general manager; H. C. Lawson, secretary. Lands include gold claims in Ferry county, Washington, and the Atlas group of 5 claims, area 100 acres, in the Stevens Peak district of the Coeur d'Alenes, Shoshone county, Idaho. Development is by a 250′

tunnel, claimed to show a 20′ ore body averaging $50 per ton in copper, gold and silver values.

MARITIME COPPER & REDUCTION CO. **NEW BRUNSWICK.**

Mine office: Goose Creek, St. John county, N. B. An old property, reopened 1902. Principal ore body is large and low in grade. Probably idle.

MARKEEN COPPER CO. **ARIZONA.**

Office: 66 Broadway, New York, N. Y. Thos. A. Lee, president; Thos. E. Warman, secretary; Leopold Balbach, general manager. Had 370 acres in the Greenlee district of Graham county, Ariz., showing large bodies of low-grade argentiferous and auriferous chalcopyrite. Advertised extensively and sold much stock, but neglected to do the $1,800 worth of annual assessment work required to hold its lands, hence same were "jumped" Jan. 1, 1903.

MARQUETTE & ARIZONA MINING CO. **ARIZONA.**

Office: Marquette, Mich. Mine office: Bisbee, Cochise Co., Ariz. Organized Dec. 6, 1902, under laws of Arizona, with capitalization $500,000, shares $5 par. Emil Marks, president and general manager; S. B. Jones, vice-president; Jos. J. Wirtz, secretary; preceding officers, Louis Grabower, Albert Hornstein, Luther Lindauer and Lawrence Christianson, directors; J. R. Henderson, superintendent. Lands, 37 claims, area 740 acres, adjoining the Copper Glance on the east. Has shafts of 28′ and 560′, also sundry pits showing iron with copper stains. Tract has a heavy conglomerate capping much similar to that of the Copper Glance. Main shaft has 2 compartments, substantially timbered, passing through limestone showing considerable iron, and is quite wet, much of the shaft showing country rock assaying about $2 per ton in gold. The shaft has short north and south drifts on the 400′ level and one short drift on the 145′ level. Has a 35-h. p. hoist, using "niggerheads" for fuel, these being gathered by team from the surrounding desert. S nking was suspended at the close of 1903 and a diamond drill installed for further exploratory work.

ANGEL MARQUIEQUI. **BOLIVIA.**

Mine office: Coro Coro, La Paz, Bolivia. Works a conglomerate carrying native copper. Has steam power and employs 35 to 50 men.

MARSHALL & RUSSELL GOLD MINING, MILLING & TUNNEL CO. **COLORADO.**

Mine office: Marshall Park, Colo. W. C. Marshall, superintendent. Ores carry gold, silver and copper. Has water power and employs about 20 men.

MARTHA WASHINGTON MINE. **UTAH.**

Mine office: Silver City, Juab Co., Utah. Primarily a silver mine, but ore carries 2% to 3% copper.

MASCOT TUNNEL CO. **COLORADO.**

Mine office: Turret, Chaffee Co., Colo. Elmer E. Brigg., superintendent. Ores carry gold, silver and copper. Was developing with a small force at last accounts.

MASHELL COPPER MINING & REDUCTION CO. **WASHINGTON.**

Office: 437 Banigan Bldg., Providence, R. I. Mine office: Etonville, Pierce Co., Wash. C. J. McCormick, president; J. M. Mansfield, secretary and treasurer. Limited development work has shown several small veins giving good assay values in gold and copper, especially the former. Idle at last accounts.

MASON & BARRY, LTD. **PORTUGAL.**

Office: 87, Cannon St., London, E. C., Eng. Mine office: Pomarao, Alemtejo province, Portugal. Sir Francis Tress Barry, M. P., chairman; James Francis Mason, J. P., deputy chairman; Edw. O. Barry, secretary. Capital, nominal, £210,000; issued, £185,145; capitalization was originally ten times present amount. Company has been a large dividend payer since 1878. The accounts for 1902 show a net profit of £90,495, earned from 170,563 tons of ore mined and 405,111 tons of ore shipped. Property is the San Domingos mine, originally opened and extensively worked by the Romans, and taken over by predecessors of present company in 1858. Mine is opened for a width of about 200′ and length of about 2,000′, producing cupriferous pyrites carrying slightly under 1% copper, with 45% to 50% sulphur. After burning for sulphur the cinder is leached for copper. Annual copper production is about 8,000,000 lbs.

MASS CONSOLIDATED MINING CO. **MICHIGAN.**

Office: 6 Beacon St., Boston, Mass. Mine office: Mass City, Ontonagon Co., Mich. Employs about 200 men. Organized 1899, under laws of Michigan, with capitalization $2,500,000, shares $25 par, $17 paid in. Annual meeting, second Thursday in March. Chas. A. Lamb, president; F. W. Hunton, vice-president; Wilfred A. Bancroft, secretary and treasurer; Jas. M. Wilcox, superintendent; preceding officers, Ben. T. Cable, J. W. Davis, C. F. Lynde, W. H. Bailey, C. H. Bennett and G. A. W. Dodge, directors; Chas. H. Krause, mill superintendent; W. A. Brown, clerk; E. V. Palmer, engineer; Thos. Hall, mining captain; Samuel V. Rawlins, master mechanic; Old Colony Trust Co., of Boston, transfer agent. On Jan. 1, 1903, the company had a balance of assests of $199,018.23, exclusive of mine and plant. Mineral lands, 2,400 acres, are in a very irregular but fairly compact tract in Sections 33, 34 and 35, T. 51 N., R. 38 W., and in Section 1, T. 50 N., R. 39 W., bounded on the north by the Union, Adventure and farm lands; on the east by the Adventure, Toltec and Evergreen; on the south by the Flint Steel and the Knowlton mine of the Adventure and on the west by the Flint Steel, Adventure and St. Mary's Mineral Land Co. Lands include three old mines, the Ridge, Mass and Ogima, also two old prospects, the Merrimac and Hazard, joint production of which, under previous managements, was 5,565 tons, 1,023 lbs. refined copper. The Ridge mine, operated 1850-1874, made 2,567 tons, 449 lbs. of copper and paid dividends of $100,000. The old Mass mine was opened 1856 and worked intermittently until 1886, securing a total output of 2,507 tons, 266 lbs. of copper, and the Ogima, opened 1860 and closed 1868, made 491 tons, 308 lbs. of copper. The Merrimac

rd were early-day explorations, without production. These five
are described in detail in Vol. II.
lass tract carries six of the seven cupriferous amygdaloids of
een belt, these averaging about 10′ width, but varying greatly
to point, with a sharp bend in their strike, this varying from
on the north, to N. 37° E. at the south. The dip of the lodes
38° at the Ridge to 47° at the old Mass mine. The lodes of
onsolidated are as follows, from north to south:
nowlton. Little opened. Carries heavy copper and stamp

lass. Lies 140′ south of the Knowlton. Carries a little heavy
stamp rock.
orth Butler. Lies about 75′ south of the Mass bed. Opened
, being wide and fairly mineralized where cut.
utler. Lies about 200′ south of the North Butler. Is 12′ to
d very bunchy, carrying mainly stamp copper, with some mass.
gima. Lies about 100′ south of the Butler. Is mainly a stamp
some barrel-work and occasional masses. Runs 10′ to 25′ wide
little good ground in the few openings secured.
vergreen, or Ridge. Lies about 250′ south of the Ogima. Is the
f the property, running 4′ to 40′ wide, and usually being richest
od width. Is very bunchy but shows some good stopes yielding
er and stamp rock.
ass has openings on all of its copper-bearing beds and rock is
rough the nearest shaft, communication between lodes being
crosscuts on various levels. The Mass has the outcrop of the
Evergreen belt for about 1½ miles, giving a total of 7½ miles
eds.
haft, formerly known as the Ridge, has 3 compartments and
ck over a 900′ trestle to the rock-house at "B." Is down to
vel on the Evergreen lode, and is connected with the Butler lode
s on the 6th, 7th and 8th levels. The Evergreen lode runs nar-
than in "B" shaft, averaging only 8′ to 10′ width, but shows
of excellent grade.
haft is old No. 3 Ridge, cut down to 2-compartment size, re-
nd deepened four lifts below the 11th level. This shaft shows
stopes of 20′ to 25′ width, producing mass and barrel copper.
strong, with plainly defined walls, and has a dip of 43°. There
tions with the Butler lode on the 4th, 6th and 7th levels. The
ouse is of wood, iron-sheathed, 48x65′ and 80′ high, fitted with
ners, two 22x28″ Blake crushers and a 12x24″ Nordberg engine,
for additional crushers if needed.
aft, started by the Ogima, has been cut down to 3-compartment
about 500′ deep. It is about a quarter-mile southwest of "B"
ve shorter trams than "A" or "B." The Knowlton lode was
, 1903, and found 18′ wide. Drifts are being sent both north

and south from the crosscut, the lode showing heavy copper and stamp ro

The prospective site for "D" shaft is 2,100′ southwest of "C."

There are a number of old shafts, the 450′ main shaft of the old M mine proper, having 7 levels opened on the Knowlton lode. This w pumped out in 1901 and the showing pronounced satisfactory. The Ogi lode has been opened at several points by crosscuts from "A" and " shafts and was found bunchy, though showing good stopes. The mine, a whole, is notably rich in mass copper and carries considerable silver valu the ground ranging from very rich to absolutely barren. All rock selecti is made underground and culls used for filling. The mine is worked d shifts only.

"A" and "B" shafts are operated from a 44x150′ central engine hou of wood, iron-sheathed. The hoist is a 24x48″ Allis-Chalmers duplex, wit 10′ drums having 11′ faces, grooved for 1½″ cable and good for a half-mil depth, operating two six-ton skips in counterbalance, one in each shaft The engine house also covers boilers, compressors and electric machinery There are two 250-h. p. Stirling water-tube boilers, a 50-drill two-stage cross-compound Rand air compressor and a 75-kilowatt dynamo that furnishes electric lights for the various mine buildings.

In addition to the usual mine buildings there are about 50 dwellings, some new, but mostly old buildings thoroughly remodeled. The company also has a townsite, Mass City, which is the terminus of the Mineral Range railroad and a station on the C. M. & St. P. railway. This town has a number of business houses, a bank, newspaper, hotels, etc., and is much more than an ordinary mining location, the realty holdings therein of the Mass company being of considerable value.

The Mass mill is at Keweenaw Bay, on an arm of Lake Superior at the junction on the Mineral Range and Duluth, South Shore & Atlantic railways, 16 miles south of Houghton and 34 miles northeast of the mine. There is ample sand-room, deep water and immunity from heavy seas. The mill is 90x210′, of steel on stone foundations, built by the Wisconsin Bridge & Iron Co., with two stamps having vertical mortar-grates supplied with automatic hydraulic cleaning devices, and has jigs and four Wilfley tables. Each head has a nominal stamping capacity of about 525 tons daily. The 30x60′ boiler house, of wood with iron sheathing and truss roof, has two 225-h. p. Stirling boilers. Ashes and cinders are washed into the lake through a launder. The 40x70′ pumphouse has a 16,000,000-gallon Nordberg vertical pump. Underneath is a 12x30′ well, with bottom 6′6″ below mean water level, connected with a tunnel running 300′ under the bed of the bay to the intake. A 1,000′ wharf, also serving as a breakwater, has 18′ of clear water at its end, with three towers and derricks to unload coal vessels at the rate of 900 tons daily. Coal is taken from the wharf in 3-ton cars by a 14x20″ hoist, over a 1,500′ trestle of 20,000 tons storage capacity. There is also a 30x40′ warehouse, with office in front, a smithy, machine shop and about a dozen dwellings on a townsite platted by the company, this also having several business buildings and a number of private dwellings.

Stamping was begun with one head in August, 1901, and the second head put in commission in August, 1902. It being found impracticable to supply selected rock for two heads, one head has been leased to the Michigan mine, leaving one stamp running days only on Mass rock, which is quite refactory, giving a present stamping capacity of 200 to 225 tons daily. Returns from stamp rock are very small, running probably 11 to 14 lbs. of refined copper per ton, or about the same as the Atlantic and Isle Royale, but about 45% of the mine's production is heavy copper that does not see the mill. Production of refined copper was 873,297 lbs. in 1901; 2,345,805 lbs. in 1902 and about 2,750,000 lbs. in 1903. The cost of copper made in 1902 was upwards of 14 cents per lb., mining costs being $1.16 per ton and mass copper constituting 45% of the output, the mineral averaging 77% refined copper. Forces were much reduced late in 1903 and at the close of the year the mine was working 20 drills, in place of 33 formerly employed. December, 1903, rock shipments of 6,400 tons yielded 75 tons of mineral and about 85 tons of mass copper, or about 37 lbs. of refined copper per ton, and it is officially stated that during the last half of 1903 the company earned a small net profit.

MASSEY STATION MINING CO. **ONTARIO.**

Office: 7 Wall St., New York. Mine office: Massey Station, Algoma, Ont. Organized 1900, under laws of Ontario, with capitalization $1,000,000, shares $100 par. J. J. Thompson, president; Robt. McKay, secretary; Jos. Errington, general manager; R. C. Barclay, clerk and purchasing agent; James Summers, mining captain. Lands, 640 acres, also 160 acres miscellaneous lands, in Salter Twp., Algoma district, Onatrio, showing 5 lenses, of which 2 are being developed, these having an average width of 10′, one being opened to length of 358′ and depth of 370′, giving assays of 5% copper, with traces of gold and silver. Main shaft is 370′, with 4 levels, opened 80′ apart, and about 200′ of drifting on each level. Estimated amount of ore blocked out for stoping is 50,000 tons. Has a steam plant with 6-drill Ingersoll-Sergeant air compressor and 6½x8″ and 10x12″ Lidgerwood hoists. Ore is shipped 50 miles to the smelter at Copper Cliff, where it is used for fluxing the nickel-copper ores of the Canadian Copper Co.

MAY DAY MINING CO. **UTAH.**

Mine office: Eureka, Juab Co., Utah. J. A. Hunt, superintendent. Is a gold and silver mine, making some copper as a by-product. Has steam plant and concentrator, and employs 40 to 50 men.

MAYFLOWER MINING CO. **MICHIGAN.**

Office: 60 State St., Boston, Mass. Mine office: Calumet, Houghton Co., Mich. Organized 1899, under laws of Michigan, with capitalization $2,500,000, shares $25 par, $8 paid in. Annual meeting, third Wednesday in March. H. F. Fay, president; Geo. G. Endicott, secretary and treasurer; Jas. Chynoweth, superintendent; preceding officers, John C. Watson, Manning Emery and Stephen R. Dow, directors.

Official returns to the state of Michigan as of date Jan. 1, 1903, disclose the following figures:

Amount cash paid in on capital stock	$300,000.00
Amount paid in by conveyance of property to company	500,000.00
Entire amount invested in real estate	540,000.00
Amount of personal estate	85,363.[illegible]

Lands, 840 acres, in Sections 7 and 8, T. 56 N., R. 32 W., also a millsite on Torch Lake, Houghton, county, Michigan. The Kearsarge mine lies to the north, Old Colony to the south and the South Kearsarge and Wolverine mines to the west. Exploratory work was begun in 1899 and still continues. No. 1, or Faull, shaft is 400′ deep, with considerable drifting on the first and second levels and has a crosscut opening two parallel cupriferous amygdaloids. This shaft shows occasional patches of copper but nothing of much promise. No. 2, or Isle Royale, shaft, 160′ deep, with several hundred feet of drifting, shows a bunchy amygdaloid, 10′ to 12′ wide, carrying more or less copper in a 2′ streak next the hanging wall. No. 3, or Sandstone shaft is 60′ deep, in a soft and badly broken amygdaloid, all of the strata near the Eastern sandstone being much disturbed. No. 4 shaft, 559′ deep, starts from surface on an unnamed amygdaloid lying approximately 2,000′ east of the Kearsarge bed, and at a depth of 425′ runs into a parallel amygdaloid lying 90′ to the eastward of the first bed, this flying switch being caused by the angle of dip of the strata flattening at little depth. The north drift from the bottom of this shaft shows occasional patches of good stamp-rock, but so far they are too limited and too far apart to give much promise of profit. Surface improvements include a hoist good for 600′, boilers and air compressor, with necessary buildings.

MAZAPIL COPPER CO., LTD. MEXICO.

Offices: 47, Peter St., Manchester, Eng. Mexican general office: Apartado 17, Saltillo, Coahuila, Mexico. Mine office: Mazapil, Zacatecas, Mex. Registered April 21, 1896, as a reorganization, with capital £200,000, shares £10 par. Wm. Purcell, managing director; W. S. Browning, superintendent. Lands include the San Elijio, Salaberna and other mines, having auriferous and argentiferous copper ores, with 83 different shafts and mines. District is arid and operations are frequently hampered by shortage of water. Company plans building an aerial tram to connect the mine with a railroad near San Pedro Ocampo, and to install new machinery. Production is considerable, reaching to perhaps 7,000 tons of auriferous and argentiferous copper and lead ores monthly. It is proposed to construct a new smelter at Saltillo and abandon the present inadequate and poorly located smelter at Concepcion del Oro.

MAZE MINE. JAPAN.

Mine office: Nishi-Kambara-gori, Echigo, Japan. Opened 1688. Production has decreased latterly. Has several small veins, averaging 1′ in width, carrying chalcopyrite and iron pyrites, frequently associated with sphalerite and galena, lying mainly in propylite. The ore yields 17% to 20% copper after careful selection. Production for 1900 was 110,582 lbs., refined copper.

MEADOW MINING CO. **MICHIGAN.**

Office: 50 State St., Boston, Mass. Mine office: Copper Falls, Keweenaw Co., Mich. Organized 1898, under Michigan laws, with capitalization $1,500,000, shares $25 par. W. F. Fitzgerald, president; John Brooks, secretary and treasurer; Wesley Clark, agent. Lands, 364 acres, adjoining the Humboldt and Phoenix mines. Has been slightly prospected, but was never a producer. Fully described in Vol. I.

MECHAN HERMANOS. **MEXICO.**

Mine office: Viesca, Coahuila, Mex. Operate the Santa Maria copper mine, opened by shafts and tunnels, and employ about 100 men.

MEGUNTICOOK GOLD & COPPER MINING CO. **COLORADO.**

Office and mine: Lake City, Hinsdale Co., Colo. P. G. Dawson, local director. Financial affairs were considerably muddled at last accounts, and work at a standstill.

MELBA MINING CO. **ARIZONA.**

Mine office: Patagonia, Santa Cruz Co., Arizona. R. L. Hamill, superintendent. Property is the Alta mine, carrying ores of silver, lead and copper. Has steam power and employs about 12 men.

MELCZER MINING CO. **MEXICO.**

Mine office: Pesqueria, Sonora, Mex. J. J. Hardwick, superintendent. Operates the Copete mine, equipped with steam, water and electric power and having a smelter said to be of 200-tons capacity. Ores carry copper and gold.

MELKEDALEN COPPER MINES, LTD. **NORWAY.**

Offices: 23, Leadenhall St., London, E. C., England. Mine office: Evenaes, Ofoten Fjord, Norway. G. B. Mee, chairman; W. A. Stearns, secretary. Reconstructed June 14, 1902, with capital, nominal, £120,000. Lands, 440 acres, in the Röros district of Norway. Supposed to be idle.

MEMPHREMAGOG MINING CO. **QUEBEC.**

Mine office: Bolton Centre, Brome Co., Quebec. Company owns the old Smith mine, which was idle at last accounts.

MENDOCINO COPPER KING MINING CO. **CALIFORNIA.**

Mine office: Yorkville, Mendocino Co., Cal.

MENDOTA MINE. **MICHIGAN.**

An extensive tract of mineral land in the northeastern part of Keweenaw county, Michigan, on which considerable work has been done from time to time, but idle for many years past. Fully described in Vol II.

MENDOTA MINE. **NEVADA.**

Mine office: Bullion, Elko Co., Nev. J. T. Donnellan, superintendent, at last accounts. Ores carry silver, copper and lead.

MENDOZA Y CA. **MEXICO.**

Mine office: Barranca del Cobre, Chihuahua, Mex. Produced 195 metric tons of copper in 1902.

MENLO PARK COPPER MINING CO., LTD. **NEW JERSEY.**

Mine office: Menlo Park, Middlesex Co., New Jersey.

SOCIEDAD ANOMIMA COBRES DE MENORCA. SI

Offices: Gran Via, 32, Bilbao, Spain. Employs about 75 men. O ized October, 1901, under laws of Spain, with capitalization 2,000,000 pe shares 250 pesetas par, 35% paid in. Cirilo de Gana, president; Ferr Olascoaga, vice-president; Manuel de Ozamir, secretary; Estaban P superintendent; Baron de Prisbuer, purchasing agent. Lands, 411 hect about 1,000 acres, at the base of Mt. Toro, near Mercadal, district of M Island of Minorca, Spain. Property is undergoing development.

MERAKER MINES. NOR

See Vigsnes Kobbervaerks Aktiebolag.

MERISSIKI WORKS. RU

Office: care of R. A. Richner, Batum, Russia. Mines are in the go ment of Kutais, Tiflis, Russia. Production in 1899 was 164,092 lbs. r copper.

W. & J. MERRY MINING CO. CI

Mine office: La Serena, Coquimbo, Chile. Santiago Merry, ge manager. Has steam power and smelter, employing upwards of 100

MESCAL MINING & MILLING CO. ARIZ

Said to have copper claims near Providence, Yavapai Co., Ari but letter returned unclaimed from that point.

COMPANIA METALURGICA. ME

Mine office: Matehuala, San Luis Potosi, Mex. H. N. Nichols, presi Company is building a large smelting plant, to have 2 lead furnaces copper matting furnaces.

METHOW GOLD & COPPER MINING CO. WASHING

Office: 77 Jamieson Blk., Spokane, Wash. Mine office: Wint Okanogan Co., Wash. Employs 5 men. W. D. Scott, president; Tewinkel, secretary and treasurer. Organized under laws of Washir with capitalization $90,000, shares 5 cents par. Lands, 8 claims, are acres, showing fissure veins in metamorphosed conglomerates of Hur age, carrying sulphide ores assaying 9% copper, 2 oz. silver and $5.5 per ton, developed by three tunnels, longest 465′, and a 52′ shaft. available water power and timber, and will continue development during

METROPOLITAN MINING CO. WASHING

Mine office: Berlin, King Co., Wash. H. J. McIntosh, superinte at last accounts. Ores carry gold, silver and copper and mine has power.

MEXICAN COPPER CO. ARIZ

Mine office: Martinez, Yavapai Co., Arizona. E. S. Yankee, su tendent, at last accounts. Ores carry copper, sliver and gold.

MEXICAN COPPER CO. ME

Mine office: Salinas, San Luis Potosi, Mex. R. B. Watson, ma at last accounts. Has steam and gasoline power and a small smelte

MEXICAN COPPER SYNDICATE, LTD.

Offices: St. George's House, Eastcheap, London, E. C., En

J. Peters, chairman; G. Mountier, secretary. Capital, nominal, £15,000; issued, £1,700. Location of property, if any, not learned.

MEXICAN INVESTMENT & DEVELOPMENT CO. **MEXICO.**

Office: Philadelphia, Pa. Mine office: Ejutla, Jalisco, Mex. Said to own the Agua Blanca mine, opened by Americans in 1850. Ore occurs as chalcopyrite and bornite, running 4% to 5% copper. A 50-ton concentrator is being built.

MEXICAN MINERALS CO., LTD. **MEXICO.**

Offices: 28, Budge Row, London, E. C., Eng. Letter returned unclaimed from former mine office, Zimapam, Hidalgo, Mexico. S. Crowder, managing director; Hedley D. Crowder, mine manager. Capital, nominal, £36,000; issued, £31,507; debentures, £10,000. Lands, 300 pertenencias, area about 750 acres, including the Moctezuma mine, producing copper, gold and silver. Mine is worked open-cast and has water and electric power, employing about 100 men.

MEXICAN-ARIZONA MINING CO. **ARIZONA.**

Absorbed, 1903, by New England & Clifton Copper Mines of Arizona.

MEXICAN UNION MINING CO. **MEXICO.**

Office: 753 Monadnock Bldg., Chicago, Ill. Mine office: Union de Tula, Jalisco, Mex. Employs 40 men. Organized April, 1902, under laws of Arizona, with capitalization $1,000,000, shares $1 par. Newton B. Storer, president; Chas. G. Thompson, secretary; Wm. H. Lees, general manager; B. W. Sweet, mill superintendent and engineer. Lands, 100 pertenencias, area 247 acres, in the Ayutla district, showing a 30′ fissure vein, with laterals, in limestone, opened by a 275′ shaft showing chalcopyrite giving assays of 7% copper, 10 oz. to 50 oz. silver and from a trace to $10 gold per ton. Has a 75-h. p. steam plant and has contracted for the development of a water power. A 35-ton concentrator being installed by the Allis-Chalmers Co. has a 7x9″ Dodge crusher, 1 train of rolls, one 5′ Huntington mill and 3 Overstrom tables, and is planned to go into commission about April, 1904. A smelter is being built in the district by local capital.

COMPANIA METALURGICA MEXICANA. **MEXICO.**

Office: 27 William St., New York. Mine offices: Sierra Mojada, Coahuila. Mex., and Concepcion del Oro, Zacatecas, Mex. Works office: San Luis Potosi, S. L. P., Mex. Robt. S. Towne, president and treasurer; Geo. Foster Peabody, first vice-president; A. Foster Higgins, second vice-president; Chas. J. Nourse, Jr., secretary and assistant treasurer; D. C. Brown, general manager.

At Sierra Mojada, Coahuila, James Ganett, is superintendent of the Veta Rica mine, producing ores of silver, lead and copper and having a 700′ main shaft, with full steam power equipment and employing about 250 men. At Concepcion del Oro, Zacatecas, Ludwig Heldt is superintendent of the Cerro Prieto and other mines, developed by tunnels and producing auriferous copper ores, employing about 100 men. The smelting plant is in the city of San Luis Potosi, with C. M. Van Cleve as superintendent. The smelter is rated at 1,000 tons daily capacity and is equipped throughout with modern machinery and furnaces, having a roasting plant, briquetting presses, lead and copper furnaces, etc., being supplied with steam and electric power and employing about 1,000 men.

MINA MEXICO. **MEXICO.**

Mine office: Sabinal, Chihuahua, Mex. Uriatta Hermanos, owners. Ores carry silver, copper and lead. Has steam power and employs a small force.

MEXICOLA GOLD-COPPER MINING CO. **COLORADO.**

Office: Cripple Creek, Colo. M. J. Maynard, president; T. J. Hines secretary. Organized under South Dakota laws, with capitalization $200,000. Company has three gold claims north of Rhyolite Mountain, and 9 copper claims, area 78 acres, in the Little Badger district, near Howard, Colo.

MICHIGAN COPPER & GOLD MINING CO. **UTAH.**

Office: Salt Lake City, Utah. Mine office: Frisco, Beaver Co., Utah. Organized December, 1902, under laws of Utah, with capitalization $300,000, shares $1 par. Michael H. Osborne, president; L. C. Van Voorhis, secretary. Lands, 4 claims, area 80 acres, known as the New York group, in the San Francisco district.

MICHIGAN COPPER MINING CO. **MICHIGAN.**

Office: 11-13 William St., New York. Mine office: Rockland, Ontonagon Co., Mich. Organized Jan. 5, 1899, under laws of Michigan, with capitalization $2,500,000, in 100,000 shares, $25 par, $17 paid in. Last assessment, $1 per share, was levied December, 1903. Annual meeting, first Tuesday in May. John Stanton, president; Jos. E. Gay, vice-president; J. Wheeler Hardley, secretary; John R. Stanton, treasurer; preceding officers and Alfred M. Low, directors; Saml. Brady, superintendent; S. Howard Brady, assistant superintendent; J. C. Thomas, mining captain; J. E. Vanse, engineer; Henry Stubensky, clerk; S. S. Jennison, master mechanic. American Loan & Trust Co., of Boston, transfer agent. Old Colony Trust Co., of Boston, registrar.

Official returns to the state of Michigan, as of date Jan. 1, 1903, disclose the following figures:

Amount cash paid in on capital stock	$1,000,000.00
Amount paid in by conveyance of property	670,350.00
Entire amount invested in real estate	729,119.19
Amount of personal estate	80,225.07
Amount of unsecured or floating debt	19,293.12
Production of copper, 1902	166,898 lbs.

Total expenditures to end of 1902 were $1,309,220.05, of which $727,119.19 was paid for lands and $582,100.86 was expended for equipment, mining and general expenses. Lands, 4,870 acres of mineral territory, 1,264 acres of timber lands and a 150-acre millsite, giving a total of 6,288 acres, mineral lands being in Sections 1, 2, 3, 9, 10, 11, 13, 14, 15, 16, 17, 21, 22, 23, 24, 25, 26 and 27, Town 50 North, Range 30 West. The main tract is 3 miles east and west by 4½ miles north and south, in addition to which there are four scattering tracts to the westward, one of 40, two of 80 and one of 160 acres, carrying the outcrop of the Calico amygdaloid. The Michigan tract includes the old Minnesota, Rockland and Superior mines. The Superior made 283 tons, 1,331 lbs. of refined copper, 1856-1869 and 1876-79. The Rockland, lying next east of the Minnesota, was operated 1853-1870 and made 3,105 tons, 309 lbs. of refined copper from the Minnesota contact vein, which averaged about 2′ width and carried considerable silver. The old Minnesota mine, opened circa 1847, closed 1870, made 17,352 tons, 668 lbs. of copper and paid dividends of $1,820,000. The mine was discovered by a line of prehistoric pits, in one of which was a 6-ton mass of copper, raised of skids, on top of which grew a hemlock tree having nearly 400 rings of annual growth. Immense masses of virgin copper were taken from the Minnesota, the largest, found in 1856, measuring 12′6″x18′6″x46′, weighing 527 short tons and requiring the work of 20 men for 15 months in cutting it into pieces small enough for hoisting. The Minnesota was opened on a contact vein having a gangue of quartz, epidote and calcite, with an amygdaloid hanging and conglomerate footwall, both of which were impregnated with copper near the contact. Miners called the Minnesota a conglomerate mine, because more copper was found in the footwall than in the denser amygdaloid hanging wall. The richest ground occurred near the "counter vein," a transverse fissure. The Minnesota had a 40-ton mill with gravity stamps, but its production was mainly from masses and the smaller chunks of native metal called barrel-work. The old Minnesota company met low prices for copper, a pinching of the vein and the necessity for more powerful hoists in 1870, simultaneously, and gave up the struggle. The openings above the adit level, being free from water, were worked by tributors for years afterwards, and yielded hundreds of tons of mass and barrel copper, thus affording ample evidence that an immense amount of heavy copper remains in the lower stopes, then inaccessible to tributors because filled with water. The old stopes below the water level should also yield considerable stamp rock left unmined in the days when nothing under 3% rock would pay for milling. The Minnesota had 10 shafts, the deepest being down about 1,100′. Four central shafts were sunk from surface on the North Minnesota fissure, which joined the contact at about 300′ depth. The Michigan mine is a combination of an entirely new mine and a reopened old mine, its shafts being sunk on the Calico amygdaloid, a bed outcropping 140′ north of the Minnesota contact vein and a few feet north of the North Minnesota fissure. In addition to the Calico lode, Minnesota contact, North contact and Branch vein, the Michigan tract carries the Knowlton Mass, Ogima, South Amygdaloid and an unnamed amygdaloid farther south, these latter belonging to the Evergreen belt, worked a few miles to the northeastward by the Mass and Adventure mines. The Knowlton, or northernmost of the Evergreen series of parallel lodes, is about 1,000′ south of the old Minnesota shafts, and a 7′ amygdaloid, supposed to be the Butler, has been opened to some extent in Peninsula Bluff, 2,000′ south of "B" shaft, this showing heavy copper and stamp rock. There are three old shafts on the Butler lode, also an adit cutting several parallel cupriferous beds. There are also copper-bearing amygdaloid outcrops north of the Calico bed, on which no work has been done.

The Calico parallels the contact vein, and the old Minnesota has been reopened by crosscuts, simultaneously with the development of a new mine on the Calico itself, which has been opened for nearly a half mile. The country rock is a melaphyr trap and the Calico amygdaloid ranges from almost a trap to nearly a conglomerate, carrying considerable felsite with occasional patches of sandstone and large quantities of epidote, prehnite and calcite. The strike is approximately N. 65° E., with a dip of about 46° 30′, and a width of 5′ to 25′, averaging about 9′ to 10′ wide. Most of the copper occurs in a 2′ to 3′ pay-streak near the footwall, though occasional good patches occur in the center and on the hanging wall. The copper carries a little silver and is mostly in nodules, called shot-copper, with a little barrel work and occasional small masses. the heavy copper occurring mainly near the intersections of numerous cross-fissures filled with clay gouge. The lode is strong, standing well without timber and is sinuous both as to strike and dip, with very irregular walls, the amygdaloid bed merging into the trap footwall by almost imperceptible degrees. There is also a tendency to split, the "footwall vein" being rich in such cases, but leaving the main bed very lean in copper. There is also a "hanging-wall vein," and branch veins, in addition to which the Minnesota contact and North Minnesota fissure are found within 150′ distance of the Calico. In fact the entire section between the Calico and the Minnesota contacts, and for a little distance on either side, comes very near being a sort of stockwerk, where copper may occur at almost any point, even where least expected.

There are three shafts on the Calico, "A," the westernmost, being about 1,000′ on the strike of the lode from the boundary line of the National mine. This has 3 compartments, and is 7x18′ inside of timbers and 1,781′ deep. The lode runs as wide as 18′ in places and shows some excellent ground. Stoping is in progress on the second, third and seventh levels.

"B" shaft, with 2 compartments, is 985′ east of "A" and is also 1,781′ in depth. The lode runs 20′ to 25′ wide in places and the lower levels show some good stopes. This shaft has a Burnham sinking pump, with capacity to fork 400 gallons per minute from a quarter-mile depth. The "Branch Vein" is opened from this shaft, this ore body lying between the Calico and the Minnesota contact, closely underlying the former on the fifth level but receding therefrom steadily until it touches the contact vein just above the thirteenth level, but rolling away therefrom again. The "Branch Vein" is narrow, but very rich, showing many masses up to 15 tons or more in weight, and has been opened from the fifth to the thirteenth levels by crosscuts. The old workings of the Minnesota were unwatered from "B" shaft by drill holes, bored across at each successive level. The old workings were found in very bad shape after three decades of neglect, and the contact vein is reached by crosscuts on the eleventh and thirteenth levels, below the bottom of the old workings, showing a vein of about 20′ width, with 6′ to 7′ on the hanging wall richly mineralized.

"C" shaft is 1353′ northeast of "B" and 353′ deep, with a little drifting on three levels. The formation is more settled than to the westward and the copper showing better than was secured in the other shafts at similar depth, but no work is in progress at present. The mine had 22,600′ of underground openings at the close of 1903, and was working about 20 drills on stoping and drifting.

The engine house, standing midway between shafts "A" and "B," is to be 50x115′ when completed. The "A" section is 48x50′ and has a 24x60″ double-cone straight-face Webster, Camp & Lane hoist, with a 7′ drum having a 15′ face, carrying 4,000′ of cable and capable of raising 4-ton skips in counterbalance at rate of 3,500′ per minute from a depth of 3,200′. The hoisting cable passes around solidly anchored sheaves, giving a straight pull at each shaft. At "B" shaft there is a temporary 13x16″ double hoist with 6′ drum, which will be replaced eventually by a permanent hoisting plant installed in the main engine house. The rockhouses are duplicates, of wood, with 800-ton storage bins, each having a 50-h. p. Nordberg engine, two 18x24″ crushers, one 13x20″ crusher and a steam-hammer to handle barrel copper and small masses. The main power plant and engine house, adjoining "A" engine house and eventually to be flanked by "B" engine house, has two 165-h. p. Burt boilers, with room for more, and a "Cochrane" water-heater and purifier. There is also a new 40-drill Ingersoll-Sergeant two-stage air compressor, with surface condenser and intercooler, and auxiliary compressors of 5, 10 and 12-drill capacity. The boiler house is 36x40′, with a 12′ coal storage addition.

The smithy is of stone, with three forges. There is a 30x60′ machine shop, carpenter shop, warehouse, office building and a model 22x50′ changing house. Water is supplied by the old Minnesota dam, the mine and location having mains and hydrants, with a Knowles pump in the basement of the power-house capable of raising a 5″ stream against a 400′ head, and an auxiliary Deane pump, 200′ distant, capable of raising a 5″ stream against a head of 425′. The mine has acetylene gas plants in the powerhouse and in each rockhouse. There is a 250′ coal trestle, with inclined tunnel and tramway underneath leading to the boiler-house. All buildings are connected by a private telephone system. The mine is served by the Mineral Range railroad.

Production was begun Nov. 12, 1903, with one leased head at the Mass mill. This is working day-shifts only, treating about 225 tons per diem, and securing a mineral production averaging better than 60 tons monthly in addition to which 40 to 50 tons of mass and barrel copper are made each month, giving an average return of about 35 lbs. of mineral per ton, which is a very satisfactory figure and fully up to expectations. The Michigan management is experienced and conservative and production has not been begun with the best foot forward, to make a failure in the end. The mine has not been crowded, and the returns secured can be maintained and increased.

MICHIGAN MINING CO. **WYOMING.**

Office: care of D. W. Gill, Cheyenne, Wyo.

MICHIGAN SMELTING CO. **MICHIGAN.**

Works office: Houghton, Houghton Co., Mich. Organized 1903, under laws of Michigan with capitalization $500,000, shares $25 par. Wm. A. Paine, president; Frederic Stanwood, secretary and treasurer; Frederick I. Cairns, general manager; preceding officers, John Stanton and Chas. H. Paine, directors; Frank Klepetko, consulting engineer.

The plant is located about three miles west of Houghton, near the old Atlantic stamp mill, with frontage on Portage Lake. It was designed by Frank Klepetko and will be largest and most modern in the Lake Superior district, with a capacity of 60,000,000 lbs. yearly, and is being built to smelt the mineral of the Stanton and Copper Range groups, including the Phoenix, Mohawk, Wolverine, Atlantic, Baltic, Trimountain, Champion, Winona and Michigan mines.

The plant is terraced throughout, permitting economical and largely automatic handling of material. The terraces for the different structures are sand-graded, with stone retaining walls. Mineral will be delivered to the works in 40-ton bottom-dumping steel cars, by the Copper Range railroad, which will also haul away the refined copper, for shipment from the Copper Range wharves in West Houghton. The 3,000-ton mineral storage bins, holding ten days supply for the works, are located on the upper terrace. Mineral will be dried in rotary dryers, by waste gases from the furnaces. Mineral will be taken to the furnaces in tram-cars and dumped into hoppers on the charging floor. The trestles, on an upper plateau, hold 15,000 tons of hard and soft coal, with separate storage compartments for charcoal, sand and limestone. Tunnels under the coal trestle lead to the boiler rooms and furnace, fuel being delivered in tram-cars with a down grade for loaded cars.

The main furnace building is 160x205′, of steel and brick, with truss roof and has 3 reverberatories, each 18x50′ in outside measurement, with 880 sq. ft. of hearth surface, taking 15-ton charges every 4 hours, giving a daily smelting capacity of 90 tons each, these being the largest reverberatories ever constructed. Alternating with the reverberatories are one 300-h. p. and two 200-h. p. Stirling water-tube boilers, heated by waste gases from the furnaces, the boilers requiring no changes for this novel fuel. After leaving the boilers, the waste gases will be drawn through a 6x8′ subterranean flue with arched roof up the hill to a 150′ stack with base 100′ above the furnace building.

From the reverberatories the molten copper will go to two blast furnaces, on a lower level north of the reverberatories, where blister copper will be cast mechanically. The cupola building is 40x70′, of steel and brick, with two floors. Slags will be carried mechanically to the sampling mill, and reduced in a 30-ton crusher of 100 tons daily capacity, for resmelting. The waste slags from the final fusion will be granulated by jets of water and discharged through launders to low ground northward, for grading.

The combination machine shop and power-house, of steel and brick, will have a complete equipment of shop tools with independent engine, and a 300-h. p. Nordberg horizontal tandem compound engine driving a 200-kw. generator actuating the rotary blowers for the blast furnaces. Electric power will be used extensively for operating the drying plant, casting machinery and electric cranes, and also for lighting purposes, and will actuate electric locomotives of 100-ton draw-bar pull, with overhead trolleys, connecting all parts of the plant.

Miscellaneous buildings include a combination office and laboratory, heated by exhaust steam, also a 40x60′ frame warehouse, iron-sheathed, barn, etc. The plant will have two 50′ track-scales of 150 tons capacity each, one for mineral and one for coal and flux, with several smaller scales at other points. Water is obtained from the old Atlantic dam, on Cole's Creek, through a 4,300′ flume, with capacity of 5,000 gal. per minute, leading to a 50,000-gallon water-storage tank, 100′ above the works, giving good pressure at all buildings.

The plant should be in operation in the fall of 1904, and will be largest and most complete smelter in the Lake Superior district.

MICHIGAN & ARIZONA DEVELOPMENT CO. ARIZONA.

Office: care of Little & Prindle, Guaranty Loan Bldg., Minneapolis, Minn. Organized 1903, under laws of Arizona, with capitalization $200,000, shares $2 par, 50c. paid in. C. C. Prindle, president; C. W. Sexton, vice-president and secretary; Wm. A. Paine, treasurer; Fred. B. Close, general manager. Company holds an option on 100,000 shares of the capital stock of the Helvetia Copper Co., and is reopening that company's mine. It is now planned to deepen the 400′ Isle Royale shaft to 800′ or 1,000′. Operations will be confined exclusively to development work, and if the showing secured is satisfactory, the Michigan & Arizona Development Co. will exercise its option and acquire 100,000 shares of Helvetia stock, leaving the Helvetia with 42,500 shares of treasury stock for further development and operating expenses.

MICHIGAN & ARIZONA MINING CO. ARIZONA.

Office: care of James E. Whalen, vice-president, Sault Ste. Marie, Mich.

MICHIGAN BOY MINING & MILLING CO. WYOMING.

Office: care of Dr. C. W. Long, superintendent, Denver, Colo. Lands are supposed to be in the Encapmment district of Wyoming.

MICHIGAN-MEXICAN MINING CO. MEXICO.

Office: care of Andrew F. Rosenberger, secretary, Calumet, Mich. R. Skiff Shelden, president; Chas. M. Taylor, superintendent.

MICHIGAN & MONTANA COPPER MINING & SMELTING CO. MONTANA.

Office: Kalispell, Mont. Mine office: Altyn, Teton Co., Mont. J. M. Harris, manager. Lands, sundry claims giving fair assay values in auriferous and argentiferous copper ores. Has a 100-ton concentrator and is some distance from a railroad. Property supposed to be under a $250,000 bond and lease to Brown & Platt.

MICHIGAN-NEW MEXICO COPPER CO. NEW MEXICO.

Office: Grand Rapids, Mich. Mine office: Lordsburg, Grant Co., N.-M.

J. L. Hamilton, president; C. R. Luton, secretary and general manager; Wm H. Stevens, superintendent. Lands, 4 claims, area 80 acres, in the Burr Mountains, about 15 miles from the Santa Rita mines. Ores give assay up to about 8.5% copper, $3 silver and $4 gold per ton. Has a 280′ shaf and plans installing a 50-ton leaching and cyanide plant.

MICHIGAN SAN FRANCISCO COPPER MINES SYNDICATE, LTD. **MEXICO.**

In voluntary liquidation.

JOSE MICULICICH. **PERU.**

Office and mine: San Tadeo, Yauli, Peru. Is a small producer of argentiferous copper ore.

MID MOONTA COPPER MINES, LTD. **AUSTRALIA.**

Reconstructed as Moonta Central Copper Co., Ltd.

MIDDLEMARCH COPPER CO. **ARIZONA.**

Office: 212 Henne Bldg., Los Angeles, Cal. Mine office: Middlemarch, Cochise Co., Ariz. Employs 24 men. Organized April 26, 1897, under laws of California, with capitalization $1,000,000, shares $100 par. H. Bert Ellis, president; M. M. O'Gorman, vice-president and general manager; Dr. Wm. LeMoyne Wills, secretary; Angel Moreno, mine superintendent; M. E. Anderson, mill superintendent; M. C. Erskine, Jr., engineer. Ended 1903 with $12,700 cash on hand and without accrued liabilities. Lands, 23 claims, area 460 acres, in the Middlemarch district, showing 6 parallel veins of which the 2 being developed range 30′ to 80′ in width and give average returns of 4% to 5% copper, from nothing to 10% zinc, 2 oz. silver and 60c. gold per ton, opened by a 625′ tunnel and shafts of 100′ and 305′. Veins show nearly all varieties of ore, chalcopyrite predominating. Mine has about 4,000′ of underground openings, giving about 200,000 tons of ore in sight and company estimates 100,000 tons blocked out for stoping. Has a 60-h. p. steam plant at the mine and 100-h. p. plant at smelter. Mine engine house 30x38′, is of stone and iron, with a 32x38′ boiler house. Concentrator is 40x60′, of wood, with one 8x12″ Blake crusher, 2 trains of rolls, 2 Bartlett tables, 1 slime table and 3 sizers. The smelter, 30x40′ and 3 stories high, is of wood and concrete, connected by tramway with the mine. Smelter capacity is 40 to 60 tons daily, plant having a blast furnace turning out matte of 55% to 70% in copper tenor, with variable gold and silver values. Nearest railroad, 8 miles, is the Arizona & Colorado. Wood will be displaced by oil for fuel. Mining costs average about $2 per ton and smelting costs about $5 per ton. New work planned includes a 3-compartment shaft and a new hoist. Ore was free smelting at surface but became refractory at depth, through deficiency in lime and iron, hence smelter was closed until large bodies of sulphide ore were opened at depth, but when developed water was lacking to concentrate these, until June, 1903. The present concentrator is practically a test plant and is to be replaced by a 200-ton concentrator, when experimental work has fully demonstrated the best process of concentration. Management is honest and development is along conservative lines.

NIGHT MINE. ARIZONA.

Office and mine: care of St. Charles Bros., owners, Chloride, Mohave Co., z.

DNOROUDIANSK MINE. RUSSIA.

An old and famous copper producer in the government of Nijni Tagilsk, sia. Has produced a great variety of copper minerals, and is especially ble for large pieces of massive malachite, one mass of 330 tons having found in 1836. Supposed to be idle.

FORD COPPER MINING & SMELTING CO. UTAH.

Office: 5 Walker Bank Bldg., Salt Lake City, Utah. Mine office: Milford, ver Co., Utah. Organized 1902, under laws of Utah, with capitalization ,000, shares $1 par. Geo. H. Dern, president; Chas. E. Hudson, secretary treasurer; Frank H. Lathrap, general manager. Lands, 11 claims, 220 acres, lying near the O. K. mine of the Majestic Mining & Smelting

FORD GOLD & COPPER MINING CO. UTAH.

Mine office: Milford, Beaver Co., Utah.

. MILLS & CO. MEXICO.

Office and mine: Sierra de Oro, via Horcasitas, Sonora, Mex. Employs to 30 men. C. S. Mills, general manager. Lands, 103 hectareas, known La Colorada group, also a 6-hectarea millsite, in the Ures district, wing 5 veins or dykes, ranging 2′ to 100′ in width, occurring as fissures in phyry and contacts between porphyry and phonolite, carrying gold, er, copper, nickel, cobalt and platinum. Mine is opened by a 100′ shaft a 440′ tunnel and is equipped with steam power and a small stamp and concentrator of 15 to 20 tons daily capacity. Nearest railroad is Sonora branch of the Southern Pacific, 25 miles distant.

LTON MINE. MICHIGAN.

Office: care of Byron N. White, owner, Spokane, Wash. Lands, 880 es, between the Norwich and Victoria mines, Ontonagon county, Michigan.

LTON COPPER CO. MICHIGAN.

Affairs wound up, December, 1902, and property sold for $468.40.

LWAUKEE-MONTANA NATURAL BRIDGE GOLD & COPPER MINING CO. MONTANA.

Office: 127 Third St., Milwaukee, Wis. Mine office: Contact, Park , Mont. J. M. McNulty, manager. Ores carry gold, silver and copper. s water power and 5-stamp mill, employing about 20 men.

LWAUKEE-PALMER MOUNTAIN GOLD & COPPER MINING CO. WASHINGTON.

Office: 23 Metropolitan Block, Milwaukee, Wis. Property supposed be in the vicinity of Palmer Mountain, Washington.

NDOULI MINE. FRENCH CONGO.

Mine office: Comba, via Brazzaville, French Congo State. Has a limited ount of development, but is not a producer.

E DEVELOPMENT ASSOCIATION. NEW MEXICO.

Mine office: Socorro, Socorro Co., N. M. Cony T. Brown, manager.

MINERAL MINING CO. **OREGON.**

Mine office: Huntington, Baker Co., Ore. H. C. Stratton and A. [illegible] Crook, managers. Has steam power and small smelter.

MINERAL CREEK COPPER CO. **ARIZONA.**

Supposed to own the Hummer group, near Globe, Gila Co., Ariz., but letters to that point returned unclaimed.

MINERAL CREEK MINING & SMELTING CO. **WASHINGTON.**

Office: 515 California Bldg., Tacoma, Wash. Mine office: Mineral, Lewis Co., Wash. Harold Howes, superintendent. Ores carry gold, silver, lead and copper. Has water power and 20-ton smelter, employing about 25 men.

MINERAL HILL COPPER SYNDICATE, LTD. **ARIZONA.**

See Argyle Mining Co., Ltd.

MINERAL HILL MINING CO. **WASHINGTON.**

Office: 49 West 125th St., New York. Mine office: Conconully, Okanogan Co., Wash. E. P. Wheeler, superintendent. Ores carry gold, silver, lead and copper. Has steam power and employs 15 to 20 men.

MINERAL HILL MINING & SMELTING CO. **CALIFORNIA.**

Mine office: Spenceville, Nevada Co., Cal. C. C. Bitner, superintendent. Lands, 5 claims, on which considerable development has been secured. Ores carry gold and copper. Has water power.

MINERAL MOUNTAIN CLAIMS. **CALIFORNIA.**

Six unpatented claims, 3 miles south of Iron Mountain, Shasta Co., Cal. Owned by D. T. Callahan, of Keswick, Cal. A sulphide ore body has been opened by a 200′ tunnel.

MINERAL MOUNTAIN MINING CO., LTD. **NEW MEXICO.**

Mine office: Stein's Pass, Grant Co., N. M. Chester W. Maxson, superintendent. Ores carry silver, lead and copper. Has steam power and employs 15 to 20 men.

MINERAL POINT MINING CO. **COLORADO.**

Mine office: Marble, Gunnison Co., Colo. L. Hoffman, superintendent. Lands include the Carbonate group, carrying cupriferous gold and silver ores. Has gasoline power and a 50-ton smelter, employing about 25 men.

MINGINEW COPPER SYNDICATE, LTD. **AUSTRALIA.**

Offices: 216, Mansion House Chambers, London, E. C., Eng. Mine office: Minginew, Western Australia. C. Mullen, secretary. Capital, nominal, £5,000. Holds copper property on lease.

MINGUS MOUNTAIN COPPER CO., LTD. **ARIZONA.**

Office: 516 Grant Bldg., Los Angeles, Cal. Mine office: Jerome, Yavapai Co., Ariz. Employs 8 men. R. A. Thomas, president; J. R. Thomas, secretary; W. H. Leighton, mine superintendent. Organized March, 1900, under laws of Arizona, with capitalization $3,000,000, shares $1 par. Lands, 38 claims, area 750 acres, in the Black Hills district, showing 3 fissure veins, of which 2, carrying oxide and sulphide ores, are being developed by 3 shafts, deepest 370′, with 3,555′ of underground openings, on an ore body having an extreme width of 40′ and traceable 4,000′. Has steam power. Property is regarded as promising.

MINNEAPOLIS COPPER MINING & MILLING CO. **WYOMING & MONTANA.**

Letters returned unclaimed from former office, Minneapolis, and former mine offices, Boulder, Jefferson Co., Mont., and Encampment, Carbon Co., Wyoming.

MINNEHAHA COPPER-GOLD MINING CO. **WASHINGTON.**

Office: 30 Court St., Boston, Mass. Mine office: Danville, Ferry Co., Wash. Organized under laws of Maine, with capitalization $500,000, shares $1 par. Arthur A. Dunphy, general manager. Lands, 4 claims, area about 70 acres, opened by several shallow shafts and a 206′ tunnel, and a new tunnel started, planned to be 1,124′ long. Mine shows a vein giving assays of $14 to $60 in gold and copper, with a 12″ pay-streak assaying $40 per ton. Made first shipment of ore Dec. 15, 1903. Management seems vigorous and honest, and property is regarded as promising.

MINNESOTA MINE. **MICHIGAN.**

Company wound up. Mine now owned by Michigan Copper Mining Co.

MINNIE GULCH MINING & TUNNEL CO. **COLORADO.**

Mine office: Silverton, San Juan Co., Colo. S. G. Martin, superintendent. Ores carry gold, silver and copper. Has steam power.

MINNIE HEALY MINING CO. **MONTANA.**

Office and mine: Butte, Silver Bow Co., Mont. E. H. Wilson, receiver. United Copper Co. owns 95% of stock issue. Mine is also claimed by Boston & Montana company and is the subject of extensive and continuous litigation. Mine has a 1,000′ two-compartment main shaft and is connected underground with the Leonard, Rarus and Tramway mines. When operated employs 200 men, and is a considerable producer.

MINNIE MABEL GOLD & COPPER MINING CO. **WYOMING.**

Mine office: Rambler, Carbon Co., Wyo. H. G. Richardson, president and general manager. Lands, 9 claims, area 180 acres, near the Doane-Rambler mine, in the Battle Lake district.

MINONG MINE. **MICHIGAN.**

The most important property ever developed on Isle Royale, Michigan. Has several shafts, deepest 300′. Opened 1874, closed 1879, and made 249 tons, 650 lbs. refined copper.

MINONG RANGE COPPER CO. **WISCONSIN.**

An exploration at Gordon, Douglas Co., Wis. Now idle. Described in Volume III.

MINOVACA MINE. **WASHINGTON.**

Mine office: Bossburg, Stevens Co., Wash. Owned by Wells & Evans. Ores carry gold and copper.

MINT GROUP. **WASHINGTON.**

Office: care of D. F. Strobeck, owner, Spokane, Wash. Lands, on Gold Hill, near Myers Falls, Wash., showing 3 veins, of 8′ to 25′ width, assaying 8% copper, $8 gold and 5 oz. silver per ton.

N. MIRANDA Y CA. **CHILE.**

Office and mines: Freirina, Atacama, Chile.

MISKWABIK DEVELOPMENT ASSOCIATION, LTD. **MICHIGAN.**

Office: Lake Linden, Mich. Employs 15 men. Has 35,000 shares. Jos. Bosch, president; Alfred A. Guck, secretary; Jas. Chynoweth, superintendent; Thos. Rapson, mining captain; Dr. L. L. Hubbard, consulting engineer. Lands, 575 acres, mostly owned in fee, adjoining the Central mine on the southwest, in Section 5, T. 57 N., R. 31 W., and Section 32, T. 38 N., R. 30 W. Explorations were started in June, 1903, under the advice of Dr. Hubbard, and a lode, identified as the Kearsarge, was speedily located about 4 miles northeast of Mohawk shaft No. 1, the northernmost opening previously made on the Kearsarge bed. The amygdaloid has been opened by three pits, sunk through the overburden into the ledge. The permanent shaft, sunk on the incline of the lode, has drifts running north and south, at a depth of 116′, these drifts showing highly encouraging ground. Surface plant includes a steam hoist, 10-drill air compressor and smithy. The consolidation of the Miskwabik with the Federal Copper Co. and an adjoining tract of the Union Land & Copper Co. has been under consideration. The affairs of the company are conservatively managed and the showing secured through the limited amount of work performed is highly encouraging.

MISMA MATRACAL MINES. **MEXICO.**

Office and mines: Indé, Durango, Mex. Reinaldo E. Avila, owner and manager. Ores carry copper and silver. Has steam power.

MISSOULA COPPER MINING CO. **MONTANA.**

Office: Mullan, Idaho. R. R. McCormick, president; Henry Billings, secretary. Is developing by a 1,000′ tunnel. Property is regarded as having fair prospects, and management seems honest and business-like.

MISSOURI COPPER MOUNTAIN MINING CO. **MISSOURI.**

Office: 632 Century Bldg., St. Louis, Mo. Mine office: Sullivan, Crawford Co., Mo. Capitalization $1,000,000, shares $100 par. L. M. Barnard, president; W. H. H. Myers, secretary; M. P. Welton, superintendent. Lands, 74 acres owned in fee, 690 acres leasehold and options on 7,428 acres adjoining, in Crawford, Franklin and Washington counties, Missouri. Mine was worked in a small way before the middle of the Nineteenth Century. Development is by 4 shafts and tunnels of 240′ and 1,000′, showing carbonate ores with hematite gangue and heavy clay gouge, said to average about 10% copper. Has steam power and concentrator with 16″ Blake crusher, 18″ and 22″ rolls, 4 New Century jigs, Card concentrating table and hydraulic classifiers. Smelter has a 40-ton Allis-Chalmers water-jacket furnace, with Root blower. Country rock is magnesian limestone, ore body having a good gossan capping, with vein showing chalcopyrite and iron pyrites in the sulphide zone.

MITCHELL DEVELOPMENT CO. **ARIZONA.**

Office: Ishpeming, Mich. Mine office: Bisbee, Cochise Co., Ariz. Employs about 50 men. Capitalization $300,000, shares $10 par. Samuel Mitchell, president and general manager; Jas. Chynoweth, vice-president; A. B. Miner, secretary and treasurer; Jas. Piper, superintendent; Aubrey

Fitch, clerk. Lands, 33 claims, area 660 acres, in Montezuma canyon, Huachuca mountains, Cochise county, Arizona. The topography is very rugged and a considerable portion of the holdings are fairly timbered. Lands include at least one antigua, worked for silver-lead ores by the Spaniards, probably as early as nearly 300 years ago. Country rocks are red shale, quartz and limestone, with granite-porphyry intrusions. A pocket of zinc ore was opened at surface, and the zinc and lead indications are excellent. Development is by 2 shafts and 3 tunnels, operations being considerably scattered. Main shaft is down about 250′, cutting a 3′ to 4′ vein of ore at a depth of about 200′, this showing chalcopyrite, bornite, chalcocite, and occasional native copper, the ores assaying up to 12.5% copper and 4 oz. silver per ton, with traces of gold. Equipment includes 2 gasoline hoists, these being used in preference to steam, owing to the aridity of the district. Property is connected with Bisbee by roads that are good in summer, but a bridge across the San Pedro river is needed for winter communication.

Early operations at the Mitchell were hampered by long-range directions, but this has been changed. The management is honest and conservative, and Capt. Piper, in direct charge, is an experienced Lake Superior miner. The prospects of the property at the close of 1903 were decidedly promising.

MITCHELL MINING CO. **MEXICO.**

Offices: 52 Wall St., New York; 522 Bradbury Bldg., Los Angeles, Cal., and 1302 F St., N. W., Washington, D. C. Mine office: care of La Dicha Mining & Smelting Co., Chilpancingo, Guerrero, Mexico. Employs about 250 men. Organized April 16, 1902, under laws of Arizona, with capitalization $5,000,000, shares $10 par. Geo. Mitchell, president and treasurer; Thos. H. Anderson, vice-president; C. E. Crary, secretary; Walter R. Hensey, general counsel; preceding officers, Robt. E. Morrison, Geo. A. Fitch and W. F. Bottsford, directors; E. D. Elson, general manager; H. S. Fairchild, assistant secretary.

Mining lands, 1,937 acres, include La Dicha, Mitchell, McKinley, Edward VII, Hensey, Odell and Last Chance groups, having a total area of 754 pertenencias, giving holdings of a solid parallelogram, with the axis of the tract along the strike of the vein. These lands are in the districts of Bravos and Tavares, State of Guerrero, about 25 miles in an air line from Acapulco, one of the best ports on the Pacific. In addition to mineral holdings there are about 18,000 acres of plantation lands and 164,000 acres of timber lands, latter carrying medium and high-grade woods, including some good oak and yellow pine, which will give the mine an abundant supply of timber for mining, building and commercial purposes for decades to come. The district is fertile and healthy.

The principal mining property is La Dicha group, about 2,000′ above sea-level, comprising various locations on a continuous vein of sulphide ore upwards of 5 miles in length, continuity being proven by a heavy gossan capping and also a series of mountain streams that have crosscut the vein down to the sulphide zone at intervals of a quarter to a half mile, the width of this ore body varying from 150′ to 225′. Country rocks are granite-porphyry, limestone, schists and quartz, the ore body having a granite foot-wall and schistose hanging. This ore body has been exposed to a depth of 745′ at one point, by a stream cutting through, and is estimated by Mr. Mitchell to contain at least 30,000,000 tons of 6% self-fluxing sulphide ore. In addition to this copper vein, the company has upon its extensive landed holdings promising bodies of coal and iron ore, with sundry ores of silver and gold.

Development, which has been greatly added by nature in crosscutting the vein at numerous points, is by tunnel, 250 to 500 men being employed in the company's operations, mainly in actual development work. There are also several shafts sinking, but the natural topography will permit extraction almost exclusively by tunnel, to good advantage, for some years to come. The Rio Alcaparosa parallels a considerable portion of the vein, receiving the smaller streams that have crosscut the ore body. Between shaft No. 1 and tunnel No. 1 is a stream crossing the ore body, which there has a width of 225′, and on each side of this stream tunnels have been driven into the ore, which gives assays of 7% to 25% copper. Tunnel No. 2 is about 72′ long, with 20′ in ore assaying up to 70%. Tunnel No. 3, 325′ south, is 130′ long; tunnel No. 4, 325′ next south, is 213′ long, and is to be connected with shaft No. 2, 93′ in depth, the ore shown averaging 6%. Next south, 650′, is tunnel No. 5, temporarily abandoned at a length of 74′ owing to softness of ground. Next south is tunnel No. 8, 325′ distant and 354′ long, crosscutting the vein for 102′, ore assaying 8% to 22%. This tunnel has a 125′ air-shaft, with a 50′ winze below, in good ore. Tunnel No. 7, 160′ next south, is 162′ long, and 150′ south of tunnel No. 7 is shaft No. 3, which is 84′ in depth. Next south, 650′, is tunnel No. 8, 288′ long, breasted in ore assaying up to 58%, and a winze is being sunk from this. Tunnel No. 9, 2,000′ next south, and 300′ in length, is not as yet in the vein. No. 4 shaft will be sunk to connect with this tunnel. Tunnels Nos. 4, 6, 8 and 9 are equipped with ore-cars and track. All shafts are of full two-compartment size and solidly timbered, with temporary wooden shaft-houses, iron-sheathed. None of the tunnels have reached the footwall, and results secured would indicate the existence of a vein averaging better then 100′ width for the entire section of 6,300′ now under development. While oxidized ores are shown in considerable abundance upon and near surface, the main ore body is almost exclusively chalcopyrite, of self-fluxing composition. The mine has about 7,300′ of underground openings, estimated to develop about 2,000,000 tons of ore.

About 3 miles from the southern end of the mine is a river giving an available head of 200′, if developed by a tunnel of about 1,000′ length, which would develop about 8,000 h. p. in the dry season. There is also a smaller water power available on the Rio Alcaparosa, for which a 350-h. p. plant has been ordered, for the operation of 4 hoists, 10 power drills, a sawmill, ice plant and electric lighting.

The ranch El Rincon, of 18,000 acres, owned by the Mitchell company, has 8,000 coffee trees, 16,000 cacao trees and a large number of other tropical fruit trees, with corn, potatoes, etc., under cultivation, and is feeding the large force of workmen employed. Surface improvements, mainly of a temporary nature, include a smithy, assay office, dwellings, etc. The supply of native labor is good and fairly efficient, wages ranging from 50 cents to $1.50, Mexican, per day, and averaging about 45 cents per day, gold, for all classes.

A smelter-site has been selected at a 75′ waterfall, and the town of La Dicha, with about 75 dwellings, has been platted near the mine. The Mexico, Cuernavaca & Pacific branch of the Mexican Central railway is already in operation across the Rio Balsas, and is to be completed to Acapulco, in addition to which the Mitchell company plans building a 45-mile electric railroad to the coast, this to be of narrow guage, with maximum grades of less than 2%, operated by water power and to cost approximately $250,000. Australian coke for the smelter can be laid down in Acapulco for $5 per ton.

Beyond doubt the property of the Mitchell Mining Co. is of unusual merit, but several years of time and the expenditure of several millions of dollars will be required to develop the property adequately. The ore body is of altogether exceptional size, and barring the disadvantage of location in a country difficult of access, which difficulty will eventually be overcome, the circumstances surrounding the property are unusually favorable, the good features including low labor costs, large available water power, extraction by tunnels for the first few years, cheap timber and a fertile and healthy location, with low living costs for labor.

MITSU BISHI GOSSHI KWAISHA. JAPAN.

Office: Mitsu Bishi Bldg., Yayescho, Kojimachi, Tokio, Japan. Principal office: Hanawa, Kazuno, Rikuchu, Japan. T. Nanbu, president; S. Harada, vice-president; S. Sho, secretary; R. Tayakawa, treasurer; A. Yamada, general manager. Company is an extensive producer of copper, its principal mines being the Osaruzawa, Ikuno, Yoshioka, Kamioka, Sado, Arakawa and Hisanichi.

The Osaruzawa mines are at Hanawa, Rikuchu. K. Ishihara, superintendent; K. Okamoto, smelter superintendent; W. Matsuhashi, mine superintendent; K. Ikeda, mill superintendent; T. Kawamura, engineer. Lands, about 1,000 acres, with 200 acres of miscellaneous lands, in the Kazuno district, showing innumerable fissure veins averaging 3′ width, with an average depth of 500′, and of great length, giving average returns of 6% copper from sulphide ores. Mine is operated by 8 shafts, deepest 470′ and 7 main tunnels, longest 7,500′ and has about 15 miles of underground openings. Has a 250-h. p. electric plant and a smelter with two 40-ton water-jacket furnaces, turning out blister copper 99.09% fine. The Osaruzawa mines employ about 1,000 men, and at last accounts company contemplated immediate installation of an electric hoisting plant, Herreshoff roasting furnaces and Wilfley tables. Production of the Osaruzawa mines in 1902 was 2,448,000 lbs. of refined copper.

The Ikuno mines, at Ikuno, Tajima, are under the general superintendence of T. Hori. These valuable mines were discovered A. D. 807, an in the period 1596-1620 were extensively worked under the manageme of the Tokugawa government, being taken over by the Imperial governme in 1868 and sold to the present owners in 1896. The three principal min of this group are the Tasei, Kanagase and Kasei. The Tasei mine has principal vein averaging 14′ in width, with numerous branches, traversi liparite, propylite and tertiary tuffs, carrying argentite, native gold a silver, chalcopyrite, malachite, sphalerite, galena and iron pyrites. T Kanagase mine, near by, has the same country rocks as the Tasei, but traversed by basalt dykes, a great fault-seam 30′ to 40′ in width, filled wi brecciated country rock carrying 6 veins, with chalcopyrite, bornite, tetr hedrite, native copper, argentite, stibnite, sphalerite, pyrargyrite and galen The Kasei mine has a country rock of diorite, traversed by liparite a propylite dykes, metalliferous veins occuring in the diorite and carryi chalcopyrite and native silver, with ores of antimony, lead, zinc and silve Production of the Ikuno mines in 1900 was 984,355 lbs. of refined coppe 1,260,932 momme of silver and 29,620 momme of gold. The group emplo about 1,000 men and has steam, water and electric power.

The Yoshioka mine, at Fukiya-mura, Kawadami-gori, Bitchu, h water and electric power, with a 50-ton smelter and employs about 1,0 men, with M. Fujioka as general superintendent. Property was very difficu of access until a new road was built by the Mitsui company. The mi was opened circa 1806 and has been continuously worked since then, b was never a large producer until taken by the present owners in 1873. O is chalcopyrite, associated with iron pyrites, pyrrhotite and sphalerite, wit quartz gangue, and averages 9% copper after dressing. Ore occurs in vei in country rocks of clayslate, sandstone and schalkstein, traversed by porphyr dykes. Production in 1900 was 1,722,000 momme of silver and 1,081,34 lbs. of refined copper.

The Sado mines, at Arakawa-cho, Island of Sado, 425 miles from Toki have Y. Uriu as general superintendent. The property was owned by th Mikado and operated as a sort of government mining school until 189 when bought by the Mitsu Bishi company. The mines have aurifero and argentiferous copper ores, and are equipped with steam, water an electric power and an exceptionally good plant of modern mining machiner

The Kamioka mine at Funatsu, Yoshiki-gori, Hida, is essentially silver-lead mine, the ores consisting mainly of argentiferous galena, sphalerit and chalcopyrite, associated with chrysocolla, malachite, iron pyrites an arsenopyrite. B. Matsuda and C. Tanikawa are superintendents. Th property has steam and electric power and a smelter. Since bought by th Mitsu Bishi company, in 1885, production has materially increased, th property now employing about 600 men. Output in 1900 was 537,48 kin of lead, 8,475 lbs. of copper and 148,670 momme of silver.

The Arakawa and Hisanichi mines, at Arakawa-mura, Senhoku-gor Ugo, are under the general superintendency of M. Ooye. The Arakaw formerly known as the Ugaisawa mine, was reopened 1871, and after passin through various hands was bought by the present owners in 1896. The property shows 6 principal veins, the largest averaging about 24′ width, with one-third pay ore, but occasionally branching into several small veins. The other workable veins range 5′ to 7′ in width. Ore is chiefly chalcopyrite associated with iron pyrites and frequently carrying native copper, cuprite, chrysocolla, sphalerite and galena, with a quartz gangue. The property has water and electric power and a 50-ton smelter, employing about 1,200 men. Production in 1900 was 1,734,522 lbs. of refined copper.

The Hisanichi mine, near the Arakawa, has argentiferous chalcopyrite associated with iron pyrites and sphalerite. Production in 1900 was 566,268 lbs. of refined copper.

The Makamine mine, located in Kitakata-mura, Higashi-Usuki-gori, Hyuga, was a dead mine until recently reopened by the Mitsu Bishi company. The ore is chalcopyrite, associated with iron pyrites, averaging 3.5% to 4% copper. Production for 1900 was 1,208,282 lbs. of refined copper.

The Mitsu Bishi Gosshi Kwaisha shares with the Furukawa Copper Company the honor of leading in the Japanese copper industry. Its management is exceptionally broad and intelligent and the operations of the company are attended by deserved financial success.

MITTERBERGER KUPFERGEWERKSCHAFT. **AUSTRIA.**

Mine office: Mühlbach, Salzburg, Austria. A small producer, working a vein of 6′ to 9′, carrying chalcopyrite, gold and nickel.

MIZUSAWA MINE. **JAPAN.**

Mine office: Iwasaki-mura, Waga-gori, Rikuchu, Japan. Mines two 3′ veins, at junction of granite and liparite. Ore is chalcopyrite, in quartz gangue. Production in 1900 was 200,331 lbs. refined copper.

MOBILE MINE. **GEORGIA.**

A property in Fannin county, Georgia, on which a small amount of work was done some years ago. Now idle.

MINA MOCTEZUMA. **MEXICO.**

Mine office: San José de Guadalupe, Durango, Mex. Roman Gaitau, owner and manager. Has developed a copper ore body by tunnel.

MOCTEZUMA COPPER CO. **MEXICO.**

Office: 99 John St., New York. Mine office: Nacozari, Sonora, Mex. Employs 600 men. Organized under laws of West Virginia, with capitalization $3,000,000. Jas. Douglas, president; A. C. James, vice-president; Geo. Notman, secretary and treasurer; Jas. S. Douglas, superintendent; J. S. Williams, Jr., assistant superintendent; Geo. Kingdon, mine superintendent; J. K. Stanfill, concentrator superintendent; D. S. Giddings engineer. Lands, in the Moctezuma and Arizpe districts of Sonora, include the Pilares de Nacozari mine, 6 miles east of Nacozari, also the Juarez and Nicolas ranches, area about 35,000 acres, the mine lying in a rough, hilly country, near the divide between the Yaqui and Opasura rivers. The ore occurs in a broad friction zone in which the original rock has been broken into masses ranging in size from gravel up to many tons in weight, the country rock in this crushed zone being the matrix of the ore, which is auriferous chalcopyrite and occa-

sional bornite, associated with iron pyrites, with no clearly defined foot
and with a hanging wall dipping at an angle of about 80°. There is a s
outcrop of rich carbonate ore, but croppings are mainly red-stained porph
showing considerable low-grade hematite. The leached zone is about
in depth only, with pay-ore coming in at 60′. The ore body is appare
about 800′ wide by 1,500′ long, in cross-section on surface, the area increas
at depth. The matrix is a fine-grained silicious rhyolite and the ore is
to average about 2.5% in copper tenor, as mined, before concentration.
velopment is mainly by tunnel, the Porvenir tunnel, having 20″ gauge rail
tracks, being about 3,500′ long, with extensive drifting at either side,
having storage bins in a 25x100′ chamber, to which ore is milled down fr
the upper workings. A long tunnel now driving is planned to tap the
body at a depth of nearly one-half mile. This tunnel is proving very
The main working shaft is 600′ deep, with 4 levels opened, showing so
enormous stopes, one of which, No. 4 on the 3d level, is 85′ high, 125′ w
and 150′ long.

The 600-ton concentrator is in 2 sections, equipped with 2 Blake crush
4 sets of 54x3″ roughing rolls, 2 sets of finishing rolls, 24 revolving scree
48 Hartz jigs, ten 5′ Huntington mills, 56 six-foot Frue vanners, 20 Bartl
tables, hydraulic classifiers and 7 settling tanks. Slimes from the settlers
worked by vanners exclusively, and rolls are used in crushing, to obvi
sliming as far as possible. Tailings are reground and treated on Frue v
ners. This concentrator, which was designed by Dr. L. D. Ricketts, saves
wards of 90% of the original ore values, although the ore is not easily amena
to treatment. The power equipment of the concentrator includes five 50-h
motors, eight 30-h. p. motors and one 20-h. p. motor.

The smelter, five miles from the mine and connected therewith by a narr
gauge railroad, has two 42x130″ elliptical water-jacket furnaces of the Cop
Queen type, with tilting wells on the side which can be tilted both front
rear. About 40% of the coarse concentrates go direct to the smelter
60%, mainly fines, is mixed with about 5% of clay for binder and briquet
for smelting. Sulphide concentrates are smelted without roasting. Furn
charges consist of coarse concentrates, green briquettes, flue-dust briquett
converter slag, foul slag and calc-spar. A 75-h. p. dynamo furnishes bl
Fumes from converters and furnaces pass into an 8′ horizontal steel flue le
ing to a 750′ brick flue discharging into a 70′ brick stack.

The converter has 2 stands, with 6′ 8″x9′ shells, of the Copper Qu
horizontal barrel type. The matte is of very low grade and requires ove
ton of lining to make a ton of blister copper, hence shells are lined extra thi
with low-grade gold-silver quartz, mined from the company's lands. P
duct is 99% blister copper.

The plant has steam and gas power, the latter proving more economic
The gas plant has Loomis-Pettibone generators, making both producer
water gases, which are stored in separate gasometers and mixed in due p
portions before use. The consumption of fuel is under 3 lbs. of very infe
wood per h. p.-hour. The power plant has eight 100-h. p. Crossley engi

driving 75-kw. direct-current generators and one 200-h. p. Crossley engine driving a 150-kw. generator, engines being direct-belted to generators. Power for the various departments of the concentrator and smelter is furnished from this central station. Buildings are mainly of steel, with a brick machine shop. Water is pumped from a well in the river by three Worthington and one triplex pump to a reservoir, and wash water from the concentrator is settled and used repeatedly. The company also operates a general store and maintains both Spanish and English schools for the benefit of the children of employes. Native labor is paid $2 to $3, Mexican, for 10 hours work. A 7-mile private narrow-gauge railroad, known as the York line, connects mine and smelter. The broad-gauge Nacozari railroad from Douglas reaches Cos only, but is to be extended 28 miles, from Cos to Nacozari, in 1904.

Production of refined copper in 1902 was 9,584,099 lbs., and for the first half of 1903 was 4,947,453 lbs. The company has expended several millions of dollars in development work, and despite the very low grade of the ore, and its refractory nature, has opened and equipped a successful mine and plant. The company is controlled by Phelps, Dodge & Co., which is equivalent to saying that the management is of the very best, in every respect.

MODEL GOLD MINING CO. **ARIZONA.**

Office: 1431–79 Dearborn St., Chicago, Ill. Mine office: McCabe, Yavapai Co., Ariz. Frank Jaeger, president; Chas. G. Schreiber, secretary; Chas. T. Joslin, general manager. Property is the McCabe mine, carrying ores of gold, silver and copper. Company sold stock and paid dividends simultaneously, with the usual disastrous results. The president and one director were arrested Jan. 5, 1904, for fraudulent use of the mails. Jaeger's promotions include a long list of mining and oil companies, of which the Model seems the only valuable property. It is the contention of the government that while the McCabe mine of the Model company may be and probably is of value, stock has been sold under fraudulent representations, and that false financial statements were made to shareholders.

MODERN COPPER MINING CO. **ARIZONA.**

Office and mine: Bisbee, Cochise Co., Ariz. Organized 1901, under laws of Arizona, with capitalization $1,000,000, shares $1 par. N. A. Centers, president. O. H. Briggs, vice-president and general manager; R. A. Miller, secretary. Lands are 28 unpatented claims, area 500 acres, in the northwestern end of Tombstone Canyon, Warren district, showing 5 fissure veins carrying carbonate and sulphide ores, of which one is being developed, this giving average assays of 7% copper, 10% lead, 14 oz. silver and 1 oz. gold per ton. Has steam power and four shafts of 40′, 50′, 100′ and 225′. Company has recently interested new capital, and plans active development during 1904.

MODOC MINE. **NEW MEXICO.**

A property in Grant Co., N. M., on which considerable development work is said to have been done, several years ago.

OGOLLON GOLD & COPPER CO. **NEW MEXICO.**

Office: 290 Broadway, New York. Mine office: Cooney, Socorro Co., M. Capitalization $1,000,000, shares $1 par. Paid a dividend of 2½%

July 1, 1903. Thos. F. Curran, president; Wm. Jenks, vice-president and consulting engineer; Geo. L. Brooks, secretary; W. J. Weatherbee, general manager; T. F. Cooney, mine superintendent. Lands, 30 claims, area nearly 500 acres, including the Cooney mine of 9 claims, formerly known as the Silver Bar, and 21 adjoining claims, including the Peacock group. The Cooney and Peacock mines have produced copper, silver and gold to the value of more than $1,250,000, in the past. The Cooney has a 5′ to 10′ vein with ore averaging well in copper and carrying fair gold values. The mine has 6 levels opened and at the end of 1903 was producing about 70 tons of ore daily, which is concentrated 12 into 1, in a concentrator increased to 75 tons daily capacity in 1903, and to be increased to 100 tons in 1904, the mine shipping about 6 tons of high grade-concentrates daily to the El Paso smelter. Surface improvements include a steam plant, hoists, an 800-ton ore bin, necessary mine buildings and a number of dwellings. The property is one of considerable merit, though somewhat handicapped by difficulty of access, and seems to be handled conservatively and successfully.

MOGUL DRAINAGE & TRANSPORTATION, TUNNEL, MINING & MILLING CO. **COLORADO.**

Mine office: Eldora, Colo. Idle. John A. Gilfillan, superintendent. Ores carry gold, silver, copper and lead.

MOHAWK MINING CO. **MICHIGAN.**

Office: 11-13 William St., New York. Mine office: Kearsarge, Mich. Mill office: Gay, Mich. Organized November, 1898, under laws of Michigan, with capitalization $2,500,000, shares $25 par, $21 paid in. Last assessment was $2, in January, 1903. Annual meeting, last Tuesday in March. Boston Safe Deposit & Trust Co., registrar. American Loan & Trust Co., of Boston, transfer agent. John Stanton, president; John R. Stanton, secretary and treasurer; Fred Smith, superintendent; preceding officers, Jos. E. Gay and Wm. A. Paine, directors; Willard J. Smith, assistant superintendent; Frank Getchell, clerk; B. S. Shearer, mill superintendent; John Trevorrow, mining captain; F. Wm. Hartmann, engineer.

Official returns to the state of Michigan, as of date Jan. 1, 1903, disclose the following figures:

Amount cash paid in on capital stock	$1,596,433.00
Amount paid by conveyance of property to company	450,000.00
Entire amount invested in real estate	456,236.17
Amount of personal estate	105,667.06
Amount of unsecured or floating debt	124,433.86
Production of copper, 1902	226,824 lbs.

Mineral lands, 800 acres, are in an irregular tract having its axis on the strike of the lode, in Sections 27, 28, 33 and 34, T. 57 N., R. 32 W., Keweenaw county, Michigan. The Kearsarge amygdaloid lode, on which the mine is opened, outcrops for about one mile on the Mohawk tract and the deepest shaft can be sunk on the dip of the lode for nearly one and a half miles on the company's lands. The Mohawk is 4 miles northeast of Calumet, and has the Ahmeek and Seneca on the north, the Bacon & Jacob tract on the east and south, and the Ahmeek on the west. The southern boundary is a trifle more than one-half mile from the northern boundary of the Kearsarge mine of the Osceola Consolidated, and the southermost shaft is about two miles northeast of the northernmost shaft of the Wolverine, opened on the same lode. The Mohawk, formerly known as the Fulton, was supposed to lie too far east to carry the crop of the Kearsarge lode, until the Kearsarge bed was found, accidentally, by the cutting of a wood-road, circa 1896. The property carries sundry other cupriferous amygdaloid beds, which may be given attention later, work wisely having been confined to development of a mine on the Kearsarge bed.

The Mohawk has 4 shafts, numbered from north to south. No. 1, about 1,500′ south of the point where the outcrop of the lode passes over the northern line, is 980′ deep. No. 2, about 1,100′ next southwest, is 700′ deep. No. 3, 1,100′ next southwest, is 667′ deep. No. 4,1, 300′ next southwest, is 500′ deep. The shafts are of uniform size, 8x18′ inside of timbers, with solid cribbing through the overburden, and are to have identical equipments. No. 4 shaft has a Nordberg compound conical-drum hoist, good for a depth of 6,000′ and similar hoists are to be installed in 1904 at shafts 1 and 2, and eventually at No. 3 also. Shafts 1, 2 and 4 have combination shaft-rock-houses fitted with 12x24″ Nordberg engines and rock-crushers. No. 3 rock-house, burned in the fall of 1903, is to be replaced by a steel structure in 1904. The lode runs 15′ to 18′ wide, or about the same as at the Wolverine, and is somewhat richer than the Wolverine was at similar depth, but not so rich as the Wolverine now is in its bottom workings. The openings from No. 1 shaft and the north drift from No. 2 are almost uniformly good. Between shafts Nos. 2 and 3 there is some poor ground, though this section shows improvement at depth. No. 4, the poorest shaft of the mine near surface, is now possibly the best at depth, the south drifts showing exceptionally rich ground, while the highly favorable developments at the Ahmeek, south of No. 4, insure a continuance of rich ground to the boundary line, there being room for one additional shaft south of No. 4. About 30 power drills are in use and the lower workings show a slight but steady increase in values.

Crossing the amygdaloid bed, at approximately right angles and with nearly vertical dip are 3 fissure veins carrying sundry arsenides of copper, including stibio-domeykite, mohawk-whitneyite, mohawkite and keweenawite, the latter being peculiar to this mine and described in the chapter on mineralogy. The most important commercially is mohawkite, this occurring in considerable quantities in the upper north drifts of No. 1 shaft, the vein ranging 3″ to 3′ in width and being mineralized at the crossing of the amygdaloid, and for an indefinte but usually short distance on either side. The mohawkite and allied arsenides of copper occasionally occur massive, but are commonly disseminated in an arenaceous gangue, and after hand-cobbing carry values of $100 to $150 per ton. On the 6th and 7th levels the mineral contents of the principal fissure vein are small, and apparently the production of mohawkite for the future will be trifling.

The surface plant is well adapted to the mine's requirements, including machine shop, smithy and combination carpenter shop and warehouse, each 30x60′ in size, with boiler and engine houses at each shaft, barns and a considerable number of substantial dwellings. A 60-drill air compressor is to be installed early in 1904.

The Mohawk is reached from the south by the Mineral Range railroad and is connected with its mill by the Mohawk & Traverse Bay railroad, with 13 miles of main line, owned jointly by the Mohawk and Wolverine companies, and operated under contract by the Mineral Range railroad.

The Mohawk mill, standing opposite the Wolverine mill, is at Gay, near the mouth of the Tobacco river, on Traverse Bay, Lake Superior. A 20,000,000-gallon triple-expansion Snow pump furnishes water for both mills, the pumphouse standing near the river, from which water is taken. The mill, planned for four heads, is 178x206′ in size, of steel frame sheathed with iron, on foundations of sandstone quarried from the company's own lands. A steel trestle, 350′ long and 50′ in extreme height, leads into the mill, loaded cars being pulled up this incline by a winding-engine. The first stamp was started Dec. 4, 1902, and at the close of 1903 the third head was nearly ready to go into commission. A steel pumphouse adjoining the mill has four 250-h. p. Stirling water-tube boilers. The mill is equipped with the latest washing machinery and has a Chilean regrinding mill and trolley carriers for barrel copper. The townsite at the mill, named in deserved honor of Jos. E. Gay, long and actively identified with honest and successful copper mining in the Lake Superior district, has streets, water-mains and hydrants, with a number of substantial dwellings occupied by employes. The wharf on Traverse Bay, a short distance from the mill, is 30x300′, with 14′ of clear water alongside, and is fitted with coal-hoists and storage sheds, ample for the needs of both the Mohawk and Wolverine mines.

The highly favorable estimate of the Mohawk mine given in the first edition of the Copper Handbook has been proven fully warranted by results secured in 1903, the first year's output of refined copper having been about 6,450,000 lbs., an average of about 22 lbs. of fine copper per ton from the rock stamped, or about the same as the average of the Wolverine five years previously. Production will be materially increased in 1904 by the use of the third stamp, with the assistance of No. 4 shaft. The company made substantial net earnings in 1903 and will probably be in a position to declare its first dividend in 1905. A dividend could be paid earlier, but the policy of the Stanton management is invariably a prudent one and no dividends need be expected until a reserve of at least $250,000 is provided for ordinary working capital and extraordinary contingencies. The mine is one of the best in the Lake Superior district, and its management is in every way equal to the mine.

MOJAVE COPPER CO. **CALIFORNIA.**

Mine office: Red Rock, Lassen Co., Cal. R. D. Finnie, manager, at last accounts. Has secured assays of 13% to 30% copper.

MOLLIE GIBSON GROUP. **BRITISH COLUMBIA.**

At Menzies Bay, Discovery Passage, Nanaimo district, B. C. Some development work was done and a promising ore-body encountered in 1901. Since idle.

MOLLIE STARK COPPER MINING CO. WYOMING.

Office: care of Dr. G. A. Thomas, 92 North State St., Chicago, Ill. Mine office: Encampment, Carbon Co., Wyo. J. M. Thomas, Jr., general manager. Has a 400′ tunnel opening a contact vein and ships a little ore over the aerial tram of the North American Copper Co. to the latter's smelter.

MONA & PARYS MINES, LTD. WALES.

Offices: Amlwch, Anglesey, Wales. E. J. Abbott, chairman; H. D. Harrod, secretary. Capital, nominal, £75,000; issued, £58,000; debentures, £20,000 at 6% and £10,000 at 7%. Lands, 1,067 acres, with improved water-frontage, warehouses, tramways, etc. Makes a little copper by cementation from mine-waters. Mines in this district were worked by the Romans. Parys mine was opened 1768, and made 3,000 tons of copper in 1784. Present production is 25 to 50 tons refined copper yearly.

MONARCH COPPER MINING CO. CALIFORNIA.

Office: 326 Post St., San Francisco, Cal Mine office: Callahan, Siskiyou Co., Cal. C. F. Pattey, president; Chas. K. Dickenson, secretary and treasurer. Organized under laws of South Dakota, with capitalization $200,000, shares $1 par. Lands, 640 acres, showing two veins carrying cuprite, melaconite, malachite, azurite, chalcocite, bornite and chalcopyrite, opened by a 200′ tunnel and giving assays of 11.25% copper and $2.50 gold per ton, with traces of silver. Also has a vein of auriferous and argentiferous galena.

MONARCH GOLD & COPPER MINES, LTD. BRITISH COLUMBIA.

Letters returned unclaimed from former office, Portland, Oregon, and former mine office, Nelson, B. C.

MONARCH GOLD & COPPER MINING CO. ARIZONA.

Office: 219-53 State St., Boston, Mass. John B. Hathaway, president; Geo. E. Warren, secretary; G. P. Morrill, treasurer; C. L. Barker, general manager. Lands, are in the Big Bug district of Yavapai Co., Arizona. Treasurer of the company writes that the property is not a producer and that mineral values are mainly gold.

MONARCH MINING, MILLING, TUNNEL, COLORADO.
TRANSPORTATION & POWER CO.

Mine office: Idaho Springs, Clear Creek Co., Colo. Geo. E. McClelland superintendent. Property is the Freeland mine, carrying ores of gold silver, copper and lead. Has electric power and employs about 25 men.

MOND NICKEL CO., LTD. ONTARIO.

Offices: 39, Victoria St., London, E. C., Eng. Mine office: Victoria Mines, Algoma, Ont. Works office: Clydach, Wales. Registered Sept. 20, 1900, with capitalization £600,000, in 300,000 ordinary shares, par £1; 5,000 deferred shares, par £1, and 5,000 cumulative 7% preference shares, par £5. Dr. Ludwig Mond, F. R. S., chairman; Robt. Mathias, secretary; Dr. Bernard Mohr, general manager; Hiram Hixon, mine manager. Lands, 3,350 acres freehold and 1,550 acres leasehold under 3-year option, in the townships of Blezard, Denison and Garson, Sudbury district, Algoma, Ontario, carrying cupriferous and nickeliferous pyrrhotite, quite extensively developed. Equipment includes steam plant, aerial tramway and a smelter making matte averaging about 40% each in copper and nickel. The Welch works include a new refinery and bluestone plant, and are being doubled in capacity. All mining work was suspended in spring of 1903, owing to accumulation of matte beyond the capacity of the refinery, but it is planned to resume mining in the spring of 1904.

MONITOR MINE. **MONTANA.**

At Butte, Silver Bow Co., Mont. Owned by Anaconda Copper Company and leased to Michael O'Farrell. G. A. Harrington, superintendent. Employs about 25 men. Produces copper and silver. Is connected underground with the J. I. C. and Ground Squirrel mines.

MONITOR MINING CO. **BRITISH COLUMBIA.**

Letters returned unclaimed from Alberni, Vancouver Island, B. C., but development work was in progress, with a small force, at last accounts.

MONTAGNAT MINE. **NEW CALEDONIA.**

Mine office: Diahot, New Caledonia. A new property, in process of development, said to have an ore body of considerable size.

MONTANA CONSOLIDATED MINING CO. **MONTANA.**

Letters returned unclaimed from former office, 79 Wall St., New York, and former mine office, Saltese, Missoula Co., Mont.

MONTANA COPPER & GOLD MINING CO. **MONTANA.**

Office: 135 Adams St., Chicago, Ill. Letter returned unclaimed from former mine office, Dillon, Montana. Capitalization $1,000,000. Albert G. Beaunisne, president; A. Percy Ballou, secretary. Lands, sundry claims in the Stone Creek district, Madison county, Montana.

MONTANA COPPER MINING CO. **MONTANA.**

Letter returned unclaimed from former mine office, Helmville, Lewis & Clarke Co., Mont.

MONTANA GOLD MINING CO. **MONTANA.**

Supposed to be a consolidation of the International Copper & Gold Mining Co., of Mexico, and the Montana Copper & Gold Mining Co., latter owning the Ballarat and 6 other claims in Madison county, Montana.

MONTANA MINERAL LAND DEVELOPMENT CO. **MONTANA.**

Mine office: Basin, Jefferson Co., Mont. Geo. B. Drakenfeld, general manager. Property is the Eva May mine, carrying ores of copper, silver, gold and lead. Has steam power and employs about 15 men.

MONTANA MINING & DEVELOPMENT CO. **MONTANA.**

Office: 812 Park Row Bldg., Pittsburg, Pa. Mine office: Carter, Missoula Co., Mont. Organized under laws of South Dakota, with capitalization $1,000,000, in 810,000 common shares, par $1, and 2,000 preferred shares, par $100. Nelson Weddle, Jr., president; J. F. Hinckley, secretary and treasurer; Wm. Bryan, general manager. Lands, 23 claims and 14 millsites, area 530 acres, showing a vein of 20′ to 35′ width, opened by a 200′ tunnel.

MONTANA ORE PURCHASING CO. **MONTANA.**

Office: 31 Nassau St., New York. Mine office: Butte, Silver Bow Co., Mont. Organized 1883, under laws of Montana, with capitalization $2,500,000; debentures, $1,000,000 first-mortgage 6% bonds. F. August Heinze, president and general manager; John MacGinnis, vice-president; Arthur P. Heinze, secretary; Stanley Gifford, treasurer. Is controlled by the United Copper Co., which holds 76,791 shares out of 80,000 shares issued, and owns the entire issue of bonds. Property includes the Rarus, Snohomish, Tramway, Johnstown, Glengarry, Mountain Chief and other mines, a number of which are in litigation with the Amalgamated interests over titles, apexes, etc., and several of which are owned through subsidiary corporations, in accordance with the Montana plan of organizing a variety of companies upon a single property, to the great confusion of all earnest inquirers for fundamental facts. Company leases a 1,000-ton concentrator at Basin and operates a smelter at Butte.

The following table gives a summary of operations and results for the fiscal year ending June 30, 1903:

Tons of ore mined	293,332.00
Gross yield per ton $	12.23
Total cost of mining	1,039,029.88
Cost of mining per ton	3.54
Total cost of transportation	95,332.80
Cost of transportation per ton	.325
Total cost of reduction	1,303,564.69
Cost of reduction per ton	3.62
Recapitulation:	
Gross proceeds	$3,587,691.80
Cost of mining	1,039,029.88
Cost of reduction	1,303,564.69
Freight on ore	95,332.80
Cost of marketing, refining, etc	548,514.23
Net proceeds	601,250.23

MONTANA & ARIZONA COPPER CO.

Charter surrendered and company disincorporated.

MONTANA & MICHIGAN. **MONTANA,**

Company by this name is supposed to be operating on Canyon Creek, Teton county, Montana, with a 700′ tunnel, ores assaying up to 19% copper.

MONTANA SCOTCH BONNET COPPER & GOLD MINING CO. **MONTANA.**

Office: Davenport, Washington. Mine office: Cooke, Park Co., Mont. C. A. Wilcox, superintendent. Lands include the Cora, Maggie and Jennie V. groups, carrying ores of gold, silver and copper, and employing 10 to 15 men on development work.

MONTANA VERDE COPPER CO. **MONTANA.**

Office: 21 Park Row, New York. Mine office: 82 Owsley Blk., Butte, Silver Bow Co., Mont. Jos. Johnston, general manager; N. F. Norman, secretary and treasurer. Organized 1902, under laws of South Dakota, with capitalization $2,500,000, shares $1 par. Lands are 16 claims in the Bernice district of Jefferson county, 30 miles from Butte, showing a large body of low-grade ore, traversed by numerous small veins carrying high values in copper and gold. Mine is developed by tunnels of 275' and 350' and equipped with steam power and a 10-stamp mill, employing about 25 men. Is said to have contracted to supply ore to the new smelter of the Pittsburg & Montana, at Butte.

MONTE CRISTO MINE. **MONTANA.**

Mine office: Rimini, Lewis & Clarke Co., Mont. Property idle.

MONTE CRISTO GOLD & COPPER CO. **UTAH.**

Office: 428 Dooly Bldg., Salt Lake City, Utah. Mine office: Milford, Beaver Co., Utah. Capitalization $125,000, shares 25c. par. J. L. Craig, president; C. T. Wardlow, secretary and treasurer; Edw. Mingle, superintendent. Has about 1,605' of underground development and has secured assays up to 11% copper and 72 oz. silver per ton.

MONTE RUBIO GROUP. **SPAIN.**

Mine office: Paimogo, Huelva, Spain. Under lease to United Alkali Co. C. & J. Sundheim, owners; Wm. Guthrie Bowie, manager. Lands, 100 hectareas, including Monte Rubio, Gibralter and Atbalcal Arbalcal mines. Properties have extensive remains of Roman and modern workings to the water-level, showing numerous masses of ferruginous gangue impregnated with copper oxides, sulphides, sulphates and carbonates. Lessees purpose building a railway 22 kilometres to Coiña Veral.

SOCIETE ANONIMA DELLE MINIERE DI MONTECATINI. **ITALY.**

Offices: 49, Piazza Santa Apostoli, Rome, Italy. Mine office: Bocchegiano, Grosseto, Italy. Employs 700 men. Organized 1888, with capitalization 5,000,000 lire, shares 100 lire par. Dividends paid, 1899-1902, were 82 lire per share. I. Castelbolognesi, president; Alfred Deschars, vice-president; Alfredo Santori, secretary; Paul Marengo, general manager; Paolo Cerrina, superintendent; Guglielmo Vallada, engineer.

Holdings of this company include the Montecatini, Massetana and Bocchegiano mines, all very ancient properties, worked successively by the Etruscans, Romans, Goths and Italians. Massa Maritima, 20 miles distant, on the Mediterranean railroad, is the nearest station. The gangue of the Montecatini ores is a brecciated red porphyry carrying chalcopyrite, bornite, disseminated and massive chalcocite and occasional native copper, the ores averaging about 7% in tenor as mined. Present development is by one shaft of 125 metres and 5 tunnels, giving about 8,000m. of underground openings, with about 500,000 tons of ore in sight. The property is equipped with steam power and has a concentrator with 5 crushers.

The dressed ores sent to the smelter average about 36% for the Montecatini mine and about 11% each for the Massetana and Bocchegiano mines. The smelter, at Leghorn, has 4 reverberatory furnaces and a convertor plant, also a sulphuric acid plant for the utilization of the sulphur, ores of 3.5%

tenor in copper carrying about 40% sulphur. Annual production of the company is about 5,000 to 6,000 tons of 9% to 10% ore, 12,000 tons of cuprous pyrites averaging 3.5% copper and 21,000 tons of cuprous pyrites averaging 2.5% copper tenor. For the 7 years, 1895-1901, the company produced 257,332 tons of ore of all grades, the average being, for first grade, 10.67% copper; second grade, 3.44% copper and 45% sulphur; third grade, 2.67% copper, the average of all grades for 7 years being 3.68% copper and 28.15% sulphur. Production of refined copper in 1903 is estimated at 1,400 metric tons.

MONTEREY GOLD & COPPER MINING CO.

Formerly at 11 Broadway, New York, but left no trace behind.

MONTEREY GOLD MINING CO. **WASHINGTON.**

Mine office: Bolster, Okanogan Co., Wash. M. M. Walsh, superintendent, at last accounts. Ores carry gold, silver, copper and lead.

MONTEREY SMELTING & REFINING CO. **MEXICO.**

Office and works: Monterey, Nuevo Leon, Mex. Capitalization was increased in 1903 to $8,000,000, Mexican. Has an extensive smelting plant, and does a large custom business on silver, lead and copper ores.

MONTEZUMA MINE. **SOUTH DAKOTA.**

Mine office: Deadwood, Custer Co., S. D. Owned by C. W. Carpenter, J. T. Gillmore and Robt. Giltner. Produces about 100 tons daily of low-grade ore, carrying values of $2 to $3 per ton in gold and copper, and used exclusively for fluxing-ore at the Golden Reward smelter, in Deadwood.

MONTEZUMA COPPER CO. **NEW MEXICO.**

Office: Albuquerque, N. M. Incorporated 1902, with capitalization $500,000, shares $1 par, by Geo. Crocker, Chas. Hall Wheeler and Morris P. Brewer.

MONTEZUMA LEAD CO. **MEXICO.**

Mine office: Santa Barbara, Parral, Chihuahua, Mex. A lead and zinc mine, carrying incidental values in gold and silver, with 0.5% to 1% copper. Production, about 120,000 tons of ore yearly.

MONTEZUMA MINING CO. **WASHINGTON.**

A group of 6 claims, located 9 miles from Fairfax, Wash. Ore occurs as slightly auriferous chalcopyrite, in a fissure vein traversing diorite. Has only limited development.

MONTGOMERY GOLD LEAF MINING CO. **NEW JERSEY.**

Office: Belvidere, N. J. H. G. Deshler, secretary and treasurer. Lands, mineral rights to 1,028 acres, in Pahaquarry Twp., Warren Co., N. J., formerly worked as a copper mine and showing low-grade ore in old workings.

MONTPELIER COPPER MINING & SMELTING CO. **IDAHO.**

Mine office: Montpelier, Bear Lake Co., Idaho. Fredk. W. Rose superintendent. Property includes the Duke, Emerald and other mines carrying argentiferous copper ore. Idle at last accounts, but resumption planned.

MONTREAL GROUP. **UTAH.**

Office: care of Hon. A. B. Lewis, Salt Lake City, Utah. Mine office:

Milford, Beaver Co., Utah. Lands, 300 acres. Property has shipped ore giving smelter returns of 30% copper and $6 gold per ton.

MONTREAL & BOSTON COPPER CO., LTD. BRITISH COLUMBIA.

Office: Canada Life Bldg., Montreal, P. Q., Canada. Mine office: Greenwood, B. C. Employs about 100 men. Organized 1898, under laws of Nova Scotia, with capitalization $3,000,000, shares $5 par. Annual meeting is in April. Stock is listed on the Boston exchange. State Street Trust Co., of Boston, and Munroe & Munroe, 25 Broad St., New York, are transfer agents. Old Colony Trust Co., Boston, and Knickerbocker Trust Co., New York, are registrars. H. H. Melville, president; J. N. Greenshields, first vice-president; Thos. Crockett, second vice-president; A. Munroe, secretary and treasurer; preceding officers; J. C. McDiarmid, DeLancey Nicoll, Wm. Mitchell, G. Creighton Webb, W. F. Beal, J. Wesley Allison, Chas. M. Jessup and W. N. Coler, Jr., directors; Harry Johns, mine superintendent; Albert I. Goodall, smelter superintendent; Malcolm Gailbraith, engineer.

Lands, 112 acres, held under crown grant, also a smelter site of 32 acres, a townsite of 80 acres and a water power at Boundary Falls, in the Deadwood camp on the Boundary Creek district, British Columbia. Lands show four lenses of low-grade sulphide ores containing large percentages of iron, silica and lime, rendering the ores self-fluxing. The claims of the company are the Sunset and Crown Silver, on which the principal development has been secured, also the Jewel, Morrison No. 7, Ruby, King Solomon, C. O. D. and Florence fraction. The ore gives smelter returns of about 23 lbs. of copper per ton, with gold and silver values of between $1 and $2 per ton.

The Sunset has a 412′ main shaft and the Crown Silver has a 265′ main shaft. There is also an 880′ tunnel, with total underground openings of about two miles. The bulk of the ore is won open-cast, in a large quarry. A trestle runs from the Sunset shaft to a 2,000-ton ore bin on the railroad siding whence ore is shipped to the smelter. The mine has a good power equipment, including a 100-h. p. 14x20″ duplex link-motion Jenckes hoist, an 80-h. p. 14x20″ double cylinder Lidgerwood hoist, half of a 20-drill duplex Ingersoll-Sergeant air compressor and two 80-h. p. boilers. Surface buildings include a machine shop, smithy, assay office, boarding house and bunk-houses. The smelter, at Boundary Falls, 4 miles from the mine, is connected therewith by the Canadian Pacific railway. The smelter is 120x182′ on the ground and 78′ high, built by the Standard Pyritic Smelting Co., but never operated until bought by present owners, June, 1901. There are three furnaces, 40x176″ at the tuyeres, nominally of 300 tons and actually of about 400 tons daily capacity, with crushers, rolls, Vezin and Bridgman automatic samplers, belt conveyors, No. 7 Connersville blowers and a 250-light dynamo. Smelter has 16 ore bins, each 10x34′, in the building, with 3 large ore bins and coke bins outside, having railroad tracks running above. The stone and brick dust-flue is 200′ long, leading to a stack 112′ high and 9′6″ in diameter. Slag was formerly granulated, but is now dumped molten, a 40″ slag line with 7x12″ locomotive being provided for the purpose. Product of the smelter is a matte of 45% to 55% in copper tenor, and a converter plant is needed. Operations in 1903 were considerably hampered by shortage of fuel, due to labor troubles at the coal mines and coking plants. Production for 1903 is estimated at 3,041,104 lbs. of copper, 72,754 oz. of silver and 8,009 oz. of gold, made from 132,570 tons of ore smelted, giving average returns of 23 lbs of copper, 25c silver and $1.20 gold per ton from ore treated. Mining costs are said to be about 50c. and smelting costs about $1.40 per ton. The property is of decidedly low grade, but the ore body is of immense size and quite uniform metallic contents. The management seems good and the Montreal & Boston should eventually take an important place as a copper producer.

MONTT HERMANOS. CHILE.

Mine office: San Juan, Freirina, Atacama, Chile. Principle properties are the Quebradita, 300′ deep, opened 1834; Rosario, 290′ deep, opened in 1845; Manto, 160′ deep, opened in 1846, and San José, 180′ deep, opened in 1851.

MONUMENT COPPER MINING CO. MONTANA.

Organized August, 1902, by Alex. S. Christie, et al, of Butte, Mont., with capitalization of $75,000. Lands on Bloody Dick Creek, 30 miles from Red Rock, Beaverhead Co., Mont. Was working 6 men at last accounts.

MOON GOLD MINING CO. CALIFORNIA.

Office: Valley Springs, Cal. Mine office: Richey, Amador Co., Cal. J. B. Lucas, vice-president and general manager. Has two shafts, of 100′ and 140′. Vein-stuff is a sulphide mineralization of diabase and talcose schist. Property is being developed with a small force.

MOON-ANCHOR COPPER MINING CO. WYOMING.

Office and mine: Encampment, Carbon Co., Wyo. Organized 1901, under laws of Wyoming, with capitalization $1,000,000, shares $1 par. L. W. Tennant, president and general manager; W. J. Wernli, secretary and treasurer. Lands, 3 claims, area 60 acres, in the Upper Platte district, showing a 50′ fissure vein of sulphide ore giving assays up to 10% copper and developed by a 200′ shaft. Property has a steam plant and is regarded as promising.

MOONMERA COPPER MINING CO., LTD. AUSTRALIA.

Mine office: Rockhampton, Queensland, Australia. S. Phillips, general manager. Lands, 140 acres. Country rock is granite overlaid by sandstone, showing a vein of 1′ to 7′ width carrying rich oxides and cabonates with occasional native copper, latter sometimes as flakes and small sheets but commonly disseminated in small particles. Property also shows large bodies of low-grade carbonates.

MOONTA CENTRAL COPPER CO., LTD. AUSTRALIA.

Offices: 30, Moorgate St., London, E. C., England, and Adelaide, South Australia. Mine office: Wallaroo, Yorke Peninsula, South Australia. Wm. Osmond, chairman; John Alex. Russell, secretary; John S. Scott, manager; Arthur Harvey, superintendent. Capital, nominal, £110,000; issued, £90,000. Is a reorganization of the Mid-Moonta Copper Mines, Ltd. Lands, 152 acres, are held under 99-year lease expiring 1991, from the

South Australian government. Has steam power and concentrator, employing about 75 men.

TOM MOORE CONSOLIDATED MINING CO. COLORADO.

Mine office: Eureka, San Juan Co., Colo. S. G. Martin, superintendent. Ores carry gold, silver, lead and copper. Has water power and employs 10 to 15 men.

SOCIEDAD MINERA DEL MORADO. CHILE.

Owns the Arenillas mine, opened 1860, in the department of Freirina, Atacama, Chile. Has a small matting furnace. Idle at last accounts.

FRANCISCO MORAN. MEXICO.

Office and mine: Mineral de Asientos, Aguascalientes, Mexico.

MORENCI COPPER CO. ARIZONA.

Office: 44 Broadway, New York. Mine office: Morenci, Graham Co., Ariz. Stephen Panish, president; Geo. M. Penny, secretary. Originally known as the Arizona Gold Mining & Milling Co.; reorganized as Gold Cliff Mining & Milling Co.; re-reorganized as Morenci Copper Co., and apparently disorganized again. Lands, sundry claims in the Morenci district, with a 150′ shaft showing 6% copper ore on the Micawber group. Company is apparently "waiting for something to turn up" on the Micawber claims.

MORENCI COPPER MINES, LTD. ARIZONA.

Merged, 1903, into Clifton Consolidated Copper Mines of Arizona, Ltd.

MORMON GIRL MINING CO. ARIZONA.

Office: care of Western Trust & Guaranty Co., New York Life Bldg., Chicago, Ill. Mine office: Cave Creek, Maricopa Co., Ariz. Employs 12 men. Organized Aug. 26, 1903, under laws of Arizona, with capitalization $500,000, shares $1 par. M. D. Shipman, president; B. K. Niestadt, secretary; Chas. Davies, superintendent. Lands, 4 claims, area 80 acres, also a 5-acre millsite, in the Cave Creek district, showing two 4′ contact veins, between granite and slate, and diorite and slate, giving average assays of 6% to 8% copper, 4 oz. to 15 oz. silver and $4 to $40 gold per ton, from silicates and silicious oxides and carbonates, opened by a 225′ shaft and a 400′ tunnel. Has steam power, carpenter shop, machine shop, smithy and boarding-house. Has a 25-ton mill with 5 stamps and a 10-ton Huntington mill, set tandem, also a 25-ton leaching and cyanide plant. Ores give average returns of about $20, and after crushing and amalgamation of gold on the plates, is leached for copper and tailings are afterward cyanided for gold. Copper precipitates are shipped to custom smelters.

MORNING STAR MINING CO. ARIZONA.

Letter returned unclaimed from former mine office, Dewey, Arizona.

MORONG MINE. VIRGINIA.

An old property at Virgilina, Halifax county, Virginia.

MORRISON MINES, LTD. BRITISH COLUMBIA.

Office: 407 Rookery Bldg., Spokane, Wash. Mine office: Greenwood, B. C. Idle. John Hunner, president; A. F. Oliver, secretary; Fred. H. Oliver, managing director; Gust Peterson, mine superintendent. Organized Jan. 18, 1900, under laws of British Columbia, with capitalization $1,500,000, shares 10c. par. Lands, 65 acres, crown-granted, in the Yale district, showing lenses in altered limestone carrying auriferous and slightly argentiferous chalcopyrite, opened by shafts of 55′ and 230′, with 4,300′ of tunnels, estimated to show 300,000 tons of ore, with 110,000 tons blocked out for stoping. Has a 110-h. p. steam plant with 7x9″ hoist, 5-drill Rand air compressor and necessary surface buildings. Canadian Pacific railroad is 1¼ miles distant. For 1904 company plans to ship 300 tons daily, provided railroad will construct a spur to the mine.

MOTHERLODE COPPER MINING CO. **VIRGINIA.**

Mine office: Virgilina, Halifax Co., Va. Property probably is the Morong mine.

MOUNT AETNA GOLD & COPPER MINING CO. **UTAH.**

Supposed to have property somewhere in Utah. J. A. Kauffman, superintendent.

MOUNT ANDREWS MINE. **ALASKA.**

Mine office: Coppermount, Prince of Wales Island, Alaska. Title has been in dispute, but by recent ruling of the general land office seems vested in Samuel Lichtenstadter, of New York, who is supposed to represent a Scotch steel syndicate. Property is under contract to supply a minimum of 100 tons of copper ore daily to the Brown-Alaska Copper Company, which corporation will have its new smelter in operation in 1904.

MOUNT BABINDA MINE. **AUSTRALIA.**

A Queensland property that in 1902 produced a little ore, dressed up by hand-cobbing to 23% copper and 20 oz. silver per ton, with small gold values.

MOUNT BULGA COPPER CO. **AUSTRALIA.**

A developing property in the Orange division of New South Wales, Australia. Had not begun regular production at last accounts.

MOUNT CHALMERS MINES. **AUSTRALIA.**

Mine office: Rockhampton, Queensland, Australia. Property is worked by tributors, under five-year lease. Lenses of ore occur in sedimentary rocks, in connection with dioritic intrusions. Has large bodies of iron-copper sulphides, and wet concentration does not seem available. Ore values are low, averaging 1.5% copper, 1 dwt. silver and 4 dwts. gold per ton. Is 4 miles from a state railway and will require careful handling to show a profit. Mine should be worked open-cast.

MOUNT CHALMERS COPPER MINES, LTD. **AUSTRALIA.**

Voluntarily wound up, May, 1901.

SOCIETE DES MINES DE CUIVRE DE MONT CHALMERS. **AUSTRALIA.**

Company wound up.

MOUNT DIAMOND COPPER CORPORATION, LTD. **AUSTRALIA.**

Offices: 18, Broad St. Ave., London, E. C., Eng. E. Fewings, chairman; L. G. Brown, secretary. Lands, 240 acres of leasehold, 5 miles northeast of Wandie goldfields, South Australia. Property thought to be idle.

MOUNT DONALDSON COPPER CO., LTD. **TASMANI**

Offices: 38, Gracechurch St., London, E. C., Eng. Col. H. J. Byrn chairman; D. B. Cotton, secretary. Capital, £150,000. Lands, 159 ac on Mt. Donaldson, Corinna, Tasmania. Property idle at last accounts.

MOUNT EDDY MINING & DEVELOPMENT CO. **CALIFORNI**

Had 14 claims near Sisson, Siskiyou Co., Cal. Letters to compa returned unclaimed from San Francisco.

MOUNT FISHER PROPRIETARY CO. **AUSTRALI**

Planned building a smelter at last accounts. Probably idle.

MOUNT FLORA MINE. **AUSTRALI**

Mine office: Mackay, Queensland, Australia. Made 17 tons of cop in 1901. Supposed to be idle.

MOUNT FRASER COPPER MINES, LTD. **AUSTRALI**

In voluntary liquidation. G. Addison Scott, liquidator, 5-6, Gr Winchester St., London, E. C. Lands were the Springfield claims, Cour Bathurst, Orange Division, N. S. W. Mine closed October, 1901, af securing a very limited production.

MOUNT GARNET & CHILLAGOE EXPLORATION. **AUSTRALI**

Offices: 47, Queen St., Melbourne, Australia. Colin Templeton, cha man; John Brondon, secretary. Capitalization £25,000, shares £10 p £5 5s. paid up. Lands, 4 leases, area 363 acres, near Mt. Garnet, north Queensland, Australia, on which development has shown a large body low-grade copper ore, estimated to give 100,000 tons of ore in sight.

MOUNT GARNET FREEHOLD COPPER & SILVER MINING CO., LTD. **AUSTRAL**

Property, at Mt. Garnet, Queensland, Australia, is in the hands bondholders, and is idle at present.

MOUNT HOPE MINE. **AUSTRAL**

Now known as New Mount Hope.

MOUNT JUKES PROPRIETARY MINING CO. **TASMAN**

Office: care of T. L. Hood, agent, Hobart, Tasmania. Lands, sun clams in the Mt. Jukes field, undergoing development at last accounts.

MOUNT LYELL BLOCKS COPPER CORPORATION. **TASMAN**

Offices: 72, Bishopsgate St., London, E. C., England, and 47, Queen Melbourne, Australia. Mine office: Mt. Lyell, Montague Co., Tasma Employs 20 men. C. S. Beale, secretary in London; Thos. Rollason, secret in Melbourne; Hon. N. J. Brown, agent, Hobart, Tasmania; J. H. Crittend mine manager. Registered July 27, 1899, with capital, nominal, £300,0 reorganized, 1903, to secure additional funds required for development plant. Lands, 133 acres, on Mt. Lyell. Principal ore bodies are low-gr sulphides and native copper occurring in argillaceous schists. The nat copper averages about 3% and can be concentrated by simple puddling 40% in tenor. This ore body has been proven to a depth of 420′ and is mi at a cost of about 13s. per ton. Ground is very soft and exceedingly trea erous, requiring careful mining and heavy timbering. With proper handl should be made a profitable mine.

MOUNT LYELL-COMSTOCK COPPER CO., LTD. **TASMANIA.**

Offices: 153, Leadenhall St., London, E. C., Eng., and Equitable Bldgs., Collins St., Melbourne, Australia. Mine office: Mt. Lyell, Montague Co., Tasmania. John S. MacArthur, chairman; J. J. Muir, mine manager; Thos. Urquhart, secretary, London; F. D. Mitchell, superintendent. Capital, nominal, £500,000; issued, £450,000. Lands, 93 acres, on Mt. Lyell. Is planned to consolidate with the Tasman-Lyell Copper Co., Ltd.

MOUNT LYELL CONSOLS. (NO LIABILITY). **TASMANIA.**

Offices: Equitable Bldgs., Collins St., Melbourne, Australia. J. P. Lonergan, chairman; N. Madden, secretary; H. S. Muir, mine manager; D. J. Mackay & Co., 138, Leadenhall St., London, E. C., Eng., British agents. Capital, nominal, £126,000. Lands, 50 acres on Mt. Lyell and 40 acres on Mt. Darwin. Latter tract is being prospected.

MOUNT LYELL COPPER ESTATES, LTD. **TASMANIA.**

Offices: 85, Gracechurch St., London, E. C., Eng. Mylius Cohen, chairman; F. W. Eccardt, secretary. Capital, nominal, £150,000; issued, £103,435. Lands, 4 leases, area, 145 acres, on Mt. Lyell. Idle.

MOUNT LYELL EXTENDED CO. **TASMANIA.**

Offices: 138, Leadenhall St., London, E. C., England, and Equitable Bldgs., Collins St., Melbourne, Australia. J. P. Lonergan, chairman; M. Gillmore, mine manager; J. P. Madden, secretary in Melbourne; H. M. Taylor, secretary in London. Capital, nominal, £150,000. Lands, 30 acres on Mt. Lyell and 80 acres on Mt. Darwin, latter undergoing development.

MOUNT LYELL MINING & RAILWAY CO., LTD. **TASMANIA.**

Offices: Finsbury House, London, E. C., England, and 39, Queen St., Melbourne, Australia. Mine and smelter office: Queenstown, Montague Co., Tasmania. Employs 1,669 men, of whom about two-thirds are in the reduction works. Organized 1893, under laws of Victoria, and reorganized 1903, with capitalization £1,300,000, shares £3 par; issued, £1,200,000. Has absorbed the North Mt. Lyell, South Tharsis, Royal Tharsis, King Lyell, North Crown Lyell Block, Central Lyell Block, West Lyell Extended and Prince Lyell mining companies at various times. Last absorption was the North Mt. Lyell Copper Co., Ltd., in 1903, for which purpose the company was reorganized and £600,000 in shares allotted shareholders of each of the companies merged. Has paid dividends of £910,635 19s. 6d., to June 30, 1903. Dividends, beginning 1904, will be paid semi-annually, instead of quarterly, as formerly. Bowes Kelly, chairman; Wm. Knox, M. P., vice-chairman; Robt. C. Sticht, general manager; W. P. Batchelor, chief engineer; Alfred Mellor, secretary in Melbourne; Edwin Habben, secretary in London; Hon. N. J. Brown, agent, Hobart, Tasmania; E. Carus Driffield, superintending engineer of railway; H. Single, assistant railroad engineer; W. A. Beamish, assistant mine engineer; Geo. W. Wright, assistant engineer; Geo. F. Beardsley, metallurgist; W. H. Wesley, assistant metallurgist; A. N. McNicol, mechanical engineer; P. E. Kaeppel and H. E. Bannister, accountants.

Lands, 2,237 acres, in 37 leases, mostly held from the crown for terms of 30 years, also 300 acres of railway lands and a 500-acre smelter-site. Mining lands are in the Mt. Lyell district of Montague county, on the west coast of Tasmania. Property was worked in a small way as a gold mine, until taken over by the present company, which began production in 1896. The Mt. Lyell property has six principal lenticular ore bodies, largest being the Mt. Lyell, with greatest width 270′, extreme length 660′ and depth 730′. This lense has a conglomerate foot-wall and schistose hanging-wall, carrying sulphide ores, chiefly cupriferous iron pyrites, with occasional chalcopyrite, bornite, chalcocite, tetrahedrite and native copper, giving average retu of 2.35% copper, 2 oz. silver and 0.0725 oz. gold per long ton. The l grade reserves of the Mt. Lyell ore body average 0.65% copper, 1.6 oz. sil and 0.06 oz. gold per long ton. The North Lyell gives returns of 6% 12% copper and carries 15% to 20% alumina and 60% to 75% silica, givi an ore exceedingly refractory in furnace unless fluxed with basic ores, s as are furnished by the Mt. Lyell proper. The auxiliary mines give o averaging 2.25% copper, 0.5 oz. silver and 0.25 oz. gold per long ton. average analysis of the Mt. Lyell smelting ore gives 2.35% copper, 40.3 iron, 2.04% alumina, 46.50% sulphur, 4.42% silica and 2.50% barium phate.

Mining is done open-cast in terraces at the Mt. Lyell and at the princi auxiliary mines, underground extraction being subsidiary and confined the removal of the richer patches of ground encountered during explo tion of the ore bodies. A traveling crane at the open-cast workings ass in the removal of ore. Underground workings are about 4 miles in Mt. Lyell, and 2 miles in subsidiary mines, exclusive of the North Ly developing about 5,000,000 long tons of ore in the Mt. Lyell and 300, long tons of ore in the other mines, exclusive of the North Lyell. W ings include 23 tunnels, from 40′ to 1,150′ in length, with aggregate len of about one mile. The Mt. Lyell has a 100′ surface shaft and a 168′ b shaft and 260′ of winzes, and the auxiliary mines have one 148′ surf shaft and numerous winzes. The overburden of the Mt. Lyell main body is estimated at 1,500,000 cubic yards, all of which must be stripp eventually. The mine is lighted by electricity and 2 diamond drills a used steadily in probing the ground. The North Lyell ores are much riche and show considerable ore remaining that averages better than 10% coppe The North Lyell was producing about 200 tons daily, late in 1903. Th property is very valuable, and the ore is the richest in Tasmania, but i ractory in smelting, unless blended with the basic ores of the Mt. Lyell ddition to the ore mines there are extensive silica and limestone quar- with a crushing plant near the reduction works.

The North Lyell has a 50x284′ concentrator of 120 tons daily capacity, there is another small concentrator, not in present use, that was ac- ed by the purchase of an adjoining mine.

The smelting plant is at Queenstown, 1¼ miles from the mines, re- ng ore by narrow-gauge railroad, aerial tramway and counterbalance surmounting the intervening hills, the aerial tramway being of

1,500 tons daily capacity. The smelting plant is on the Queen river, a tributary of the King river, and is in two separate sections. Smelter No. 1 has 5 water-jacket blast furnaces 40x168″ at the tuyeres, and one 36x126″ blast furnace. No. 2 smelter has five 42x27″ water-jacket blast furnaces, the latter being 20′ in height, over all. All furnaces have cast-iron water-jackets. The capacity of the large furnaces in No. 2 plant is about 350 tons daily, treating an average of about 275 tons daily, and No. 6 furnace in No. 2 smelter holds the world's record, having treated a total charge of 724 tons of matte, slag, limestone and silica in a single day. The furnaces use a 3-lb. blast supplied by nine No. 8 Root blowers and three No. 7 Root blowers, each driven by a 12x22x18″ direct-connected compound condensing vertical engine. Blast is heated by 8 hot-blast stoves of the hanging U-pipe type. Pyritic smelting is employed exclusively, using no coke on ore in the blast furnaces, and with a minimum use of coke when concentrating 15% first-fusion matte to matte of about 45% to 50% in tenor for the converters, the consumption of coke averaging only 1% for the entire metal-bearing material treated. The 75-ton converter plant has two remelting furnaces, 6 stands and 14 shells, with two 16x24x30″ compound condensing air compressors. Product is blister copper averaging 98.83% copper, 81.5 oz. silver and 3.5 oz. gold per long ton, shipped, under contract expiring 1905, to the Baltimore Copper Smelting & Rolling Co. of Baltimore, Md., U. S. A., for electrolytic refining. The smelting plant also treats custom ores. The power plant at the smelter has twelve 125-h. p. Babcock & Wilcox boilers and 16 multitubular boilers, giving a total of 3,000-h. p., with a Green fuel economizer, induced draft, and superheaters, the joint use of which effects a saving of 31% in fuel charges.

The 250-ton North Lyell smelter, 28 miles from the mine, is 75x210′ in size, with four 16x32′ reverberatory furnaces, one blast furnace and a converter plant. The North Lyell works also have a 69x72′ sampling mill, 41x66′ boiler-house with three 250-h. p. Stirling water-tube boiler and a 60x100′ power house with 200-kw. generators and cross-compound blowers.

A little cement copper is secured by leaching the mine water.

The mine has steam and electric power, with a partly-developed water power. Cordwood is used for fuel, consumption averaging about 1,200 cords weekly. Electric power is transmitted to the outlying plants and there is also a complete electric lighting system. The mining plant includes 6 underground hoists and 38 power drills. The company owns a coking plant at Port Kembla, New South Wales, this having 62 funnel-shaped ovens, doing a general commercial business in addition to supplying the company's requirements.

The company's private railroad system includes a 24″-gauge line with 6 locomotives, connecting the mines, flux quarries, smelters, warehouses and yards. There is also a 31-mile line of 42″ gauge from the smelter at Queenstown to the seaport of Strahan, with extensive wharves on Macquarie Harbor, connecting at the latter point with the Strahan-Zeehan government line, giving rail connections with all parts of the colony. The Queenstown-Strahan line traverses an exceedingly difficult country, 4½ miles of this line having gradients of 1 in 20 and 1 in 16, employing special Abt type locomotives and centre-rack railway in addition to ordinary adhesion engines. The company's private lines have 320 cars. Miscellaneous enterprises include a complete machine shop, iron and brass foundry, brickyard and sawmill.

Production in 1902 was 17,111,360 lbs. of refined copper, 662,677 oz. of silver and 22,285 oz. of gold. For the three months ending June 30, 1903, the company smelted 84,005 long tons of ore, making therefrom 1,530 long tons of copper, 167,659 oz. of silver and 6,302 oz. of gold. For the half year ending March 31, 1903, mining and smelting costs per long ton of ore were as follows: stripping overburden, 50c.; mining ore, 52.86c.; smelting, $3.0762; converting, 34.26c.; total mining and smelting costs, $4.4474 per long ton. The property is excellently handled in every department, and mining and smelting results, under the management of Mr. Sticht, have been most satisfactory. The absorption of the North Lyell was to the best interests of both mines, as each furnished an ore that was the natural complement of the other. The grumbling of sundry shareholders of the North Lyell is unwarranted, as notwithstanding their possession of a rich property they were never gratified by dividends, and probably never would have received any profits, but for the amalgamation.

MOUNT LYELL NORTH CO. **TASMANIA.**

Offices: 153, Leadenhall St., London, E. C., Eng. Cannot be learned that any work is in progress.

MOUNT LYELL PROPRIETARY MINES, LTD. **TASMANIA.**

Voluntarily wound up, June, 1901.

MOUNT LYELL SOUTH CO. **TASMANIA.**

Offices: 153, Leadenhall St., London, E. C., Eng. A twin of the Mt. Lyell North. Cannot be learned that any work is in progress.

MOUNT LYELL TASMAN COMSTOCK GOLD, SILVER, LEAD & COPPER MINING CO., LTD. **TASMANIA.**

Offices: Launceston, Tasmania. Mine office: Mt. Lyell, Montague Co., Tasmania. C. H. F. Shern, agent; F. D. Mitchell, mine manager. Employs about 25 men in prospecting and development work.

MOUNT LYELL WEST CO. **TASMANIA.**

Offices: 16, St. Helen's Pl., London, E. C., Eng.

MOUNT MOLLOY MINE. **AUSTRALIA.**

A property in the Herberton district of Queensland, Australia, that has been worked intermittently in a small way for some years. Produced about 1,200 tons of high-grade ore in 1902.

MOUNT MORGAN COPPER MINING CO. **AUSTRALIA.**

Offices: 67, Queen St., Brisbane, Australia. Mine office: Moonmera, via Rockhampton, Queensland, Australia. Samuel Phillips, general manager. At last accounts from Queensland company was being reorganized, to provide additional capital for a wet concentration plant. Lands, 200 acres leasehold, showing a very wide vein carrying oxidized and sulphide ores. Property is regarded as promising, but requires sufficient capital for development and equipment upon a modern scale.

MOUNT MORGAN GOLD MINING CO., LTD. **AUSTRALIA.**

Offices: 9, Gracechurch St., London, E. C., Eng. Mine office: Rockhampton, Queensland, Australia. V. M. Dowling, chairman and managing director; G. A. Richard, manager; J. Jenkin, secretary in London; H. Woodd, secretary in Australia. Capital, nominal, £1,000,000; called up, £875,000. Lands, 640 acres freehold and 90 acres perpetual leasehold, about 16 miles from Rockhampton. Has been a steady dividend payer since organization, Oct. 1, 1886. Is a large producer of gold, making a little copper as a by-product, lower levels of mine showing materially increased copper values. Production of copper for year ending May 31, 1903, was 106 tons, secured from treatment of 262,919 tons of ore, which also yielded 143,584 oz. of gold.

MOUNT PERRY COPPER & REID'S CREEK GOLD MINES & SMELTING CO., LTD. **AUSTRALIA.**

Voluntarily wound up, February, 1901.

MOUNT PITTON MINE. **AUSTRALIA.**

Mine office: Mt. Pitton, South Australia. T. W. Styles, manager. Has steam power and employs about 25 men.

MOUNT PLEASANT MINE. **AUSTRALIA.**

Mine office: Cobar, Robinson Co., N. S. W., Australia. Works pockets of chalcocite, chalcopyrite and carbonates, ores being sent to the Cobar plant for smelting. Is a small producer only.

MOUNT READ MINING CO., LTD. **TASMANIA.**

Offices: Worcester House, Walbrook, London, E. C., England, and Cook's Chambers, Elizabeth St., Hobart, Tasmania. H. J. Campion, chairman; M. M. Ogle, secretary in London; J. Hickson, secretary in Tasmania. Capital, nominal, £150,000. Lands, 80 acres, carrying gold, silver, lead and zinc, with about 0.5% copper, also 121 acres carrying water-rights for mill and smelter sites.

MOUNT ROSE MINE. **AUSTRALIA.**

Mine office: Wallaroo, South Australia. J. Renfrey, manager. Has steam power and employs 25 men.

MOUNT ST. HELEN'S CONSOLIDATED MINING CO. **WASHINGTON.**

Office: Marquam Bldg., Portland, Ore. Mines are at Spirit Lake, via Castle Rock, in the St. Helen's district of Skaminia county, Washington, 50 miles from Portland. Employs about 25 men. Organized 1902, under laws of Oregon, with capitalization $1,800,000, shares $1 par. Hugh McGuire, president; Chas. A. Marsh, secretary; Dr. Henry Waldo Coe, treasurer; Robert A. Foster, general manager. Lands, 35 claims, area 600 acres, also 40-acre millsite, showing 8 fissure veins, of which 5 are being given attention. Ore is sulphide, occurring as streaks 1′ to 12′ wide in a mineralized zone of low-grade ore several hundred feet in width, the richer portions assaying 9% copper, 40 oz. silver and $8 gold per ton, with occasional lead.

Has tunnels of 350′ and 420′, also sundry surface cuts. Estimated amount of ore blocked out for stoping is 20,000 tons. Equipment includes an 80-h. p. Pelton water wheel, air-compressor, power drills, sawmill, etc., and company plans building a 50 or 100-ton concentrator, as low-grade ores have shown a concentration of 18 into 1. Nearest railway 40 miles, but surveys for three lines have been made into the district.

MOUNT SHASTA GOLD MINES CORPORATION. **CALIFORNIA.**

Office: 431 Stock Exchange, Chicago, Ill. Mine office: Shasta, Shasta Co., Cal. Frank E. Ware, vice-president and general manager; H. S. Gillette, secretary. Owns the Mt. Shasta gold mine and holds sundry copper claims in the Bully Hill district of Shasta county, under bond and lease. Held an option on Capt. J. R. De La Mar's Bully Hill mine and sold stock extensively on strength of claims that that property had been purchased. Management has been guilty of gross misrepresentations and property is now entangled in litigation.

MOUNT STIRLING MINE. **CALIFORNIA.**

Owned by Kneiper & Ashbrook. Lands are in Section 10, T. 12 S., R. 23 E., Fresno county, California.

MOUNT THECKLA MINE. **AUSTRALIA.**

Absorbed by Kangaroo Hills Mining & Smelting Co.

MOUNT WASHINGTON COPPER CO. **MARYLAND.**

Property sold under foreclosure, March, 1903.

MOUNT ZIRKEL COPPER MINING CO. **COLORODO.**

Office: 240 La Salle St., Chicago, Ill. Mine office: Pearl, Larimer Co., Colo. Idle. Organized 1901, under laws of Wyoming, with capitalization $1,000,000, shares $1 par. Wm. A. McGuire, president; E. B. Boisot, secretary and treasurer; L. D. Godshall, general manager; J. J. Mackey, superintendent. Lands, 7 claims, area 60 acres, also a 5-acre millsite, in the Big Horn district, showing a 75′ fissure vein claimed by company to average 20% copper, 4 oz. silver and $10 gold per ton, and opened by a 250′ shaft. Has steam power.

MOUNTS SICKER & BRENTON MINES, LTD. **BRITISH COLUMBIA.**

Mine office: Mt. Sicker, B. C. Lands are the Copper Canyon group of 5 claims on Mt. Sicker, also 4 claims on Mt. Brenton, with total area of about 160 acres. Property carries continuation of schistose ore formation of the Tyee and Lenora mines. Has secured considerable development work on various claims, but has not yet developed a workable ore body.

MOUNTAIN COPPER CO., LTD. **CALIFORNIA.**

Offices: 3, Lombard St., London, E. C., Eng. Mine office: Keswick, Shasta Co., Cal. Employs about 300 men at the mine and 900 at the smelter and shops. Organized 1896, and reorganized 1903 with capital £1,250,000, shares £5 par; since converted to £1,000,000 of 6% debenture stock and £250,000 returned to shareholders. Wm. Keswick, chairman; A. Frewer, secretary; Lewis T. Wright, general manager; T. J. Jones, mine superintendent; A. Haskell, smelter superintendent; J. J. Murray, assistant smelter superintendent; W. Cole, railway superintendent; C. C. Jones, engineer; Vivian Bond & Co., Coffee Exchange Bldg., New York, American agents.

Mine is 10 miles northwest of Redding, near the top of Iron Mountain and was originally worked in a small way for the gold and silver in the gossan capping. Landed holdings are extensive and in addition to the present mine there is a large sulphide ore body to the north, carrying about 6,000,000 tons of low-grade ore that can probably be handled eventually. The main ore body is a solid pyritic mass, approximately 100′ to 400′ wide, 800′ long and 500′ deep, with a gossan capping of 100′ to 300′. The ore averages returns of 5% to 5.5% copper, about 2 oz. silver and slightly under $1 gold per ton, and is mainly chalcopyrite associated with pyrite and pyrrhotite, occurring in a shear zone in meta-rhyolite. The mine is worked by pillar and stall and depleted stopes are filled with rock quarried just west of the mine. As much ore is left in the pillars, the mine will undoubtedly be robbed eventually, by open-pit work. Ore reserves are estimated at upwards of 1,000,000 tons and three diamond drills are in steady use on exploratory work. As the ore is strongly pyritic, there has been considerable trouble from mine fires, but every precaution is taken to prevent these and to extinguish such as occur through spontaneous combustion.

The Keswick Smelting Works, 8 miles from the mine, are in the canyon of Spring Creek, less than a mile from the Sacramento river, and have both broad and narrow gauge railway lines connecting with the Southern Pacific railroad. The smelter has 5 water-jacket blast furnaces of 390 tons daily capacity each, with 11 Wright circular calcining furnaces, 3 stands of converters with 9 Parrott shells, 3 briquetting machines and a complete sampling plant. Ore is heap-roasted in open air, 8 to 10 weeks being required for roasting, the raw ore carrying 45% sulphur and the roasted ore 7%, a steam-shovel handling ores from the roast-heaps. The fines and ores from the roast-heaps are calcined in the Wright turret roasters, and briquetted by three machines, which also handle flue dust and calcined granulated matte, using lime for a binder. The furnaces have settlers, with slag overflow to ladle cars, and a slag railway, the matte pouring into iron casting-moulds on a slow-moving link-belt conveyor, and passing under jets of water to chill the matte, which is dumped into barrows and hoisted to the charging floor. The first fusion matte is 25% to 30% in tenor, and the second fusion matte is roasted and blown up to white metal, running into settlers and thence in ladles by traveling crane to the converters. The blast furnaces have rotary blowers driven by an Allis-Chalmers cross-compound, a Risdon cross-compound and a small auxiliary straight-line engine, steam being furnished by 3 Babcock & Wilcox boilers and 1 Heine water-tube boiler, all fired with oil. Air from the blowers is heated by stoves fired with oil, before entering the tuyeres, the hot blast effecting great economies and giving a close approach to ideal pyritic smelting, with a very small consumption of coke in the furnaces. The converter plant has an air compressor driven by a 500-h. p. Allis-Chalmers engine, and the 3 stands are controlled hydraulically from a single elevated platform. Linings for the shells are tamped by a power drill, ingeniously fitted with a special tamping iron bolted into the chuck in place of a drill. Fumes from furnaces, converters and roasters are carried through dust chambers, and flue-dust is briquetted and resmelted. In connection with the smelting plant are large machine shops, a foundry and smithy. Electric power, generated 80 miles distant, is used at a cost of ¾ of one cent per h. p.-hour. The smelter also does custom work, buying gold ores of all grades, used for fluxing the company's own ores. The mine and smelter are connected by an 11-mile narrow-gauge electric railway, climbing 2,000′ and traversing a difficult country. The company also owns the New Jersey Metal Refining Works, Ltd., at Elizabeth, N. J., which electrolytically refine the blister copper, running 98% to 99% fine. The company also secures considerable cement copper by precipitation from the mine water.

The Mountain Copper Co. has been fighting a combination of mine fires and labor unions for the past three years, but has won both fights, and is no longer subject to the dictation of either the miners' or smeltermens' unions, and at the close of 1903 was again running with full forces. The effect of these troubles was shown by the 1902 production, which was only 19,575,360 lbs. of refined copper, secured from 149,787 tons of ore smelted, giving an average return of 5.23% copper and yielding a net profit of £110,004. Company has paid dividends annually since 1897, these ranging from 5s. in lean years up to 20s. in 1899. The property is managed with great prudence and ability, both as to finances and actual operation, and affords examples in both respects that are worthy of emulation.

MOUNTAIN KEY MINE. **NEW MEXICO.**

Located in the Pinos Altos district of Grant Co., N. M. W. C. Chandler, owner and manager. Employs 15 men and is a small producer of sulphide ore carrying gold, silver and copper. Is about 700′ in depth and one of the oldest properties in the district.

MOUNTAIN LAKE MINING CO. **UTAH.**

Office: Salt Lake City, Utah. J. L. Rawlins, president and general manager; E. A. Wedgwood, secretary. Organized 1896, under laws of Utah, with capitalization $50,000, shares 10c. par. Lands, 24 claims, area about 400 acres, in the Big Cottonwood district of Salt Lake county, showing 2 contact veins, between diorite and limestone, said to be 100′ wide and traceable 2,000′, carrying ores of bornite and chalcopyrite giving average assay values of 2.5% copper, 2 oz. silver and $1 gold per ton. Has a 100′ shaft and 5 tunnels, longest 1,100′.

MOUNTAIN VIEW COPPER CO. **OREGON.**

Sold its lands in the Waldo district to Vulcan Copper Co., 1903.

MOUNTAIN VIEW DEVELOPMENT CO. **ARIZONA.**

Office: Bisbee, Ariz. Organized 1903, under laws of Arizona, with capitalization $1,000,000. Geo. Bennett, president; Gano S. Crockett, secretary; I. E. Holmes, treasurer and general manager. Lands are a group of claims lying northwest of Bisbee, showing ore assaying 3% to 50% copper, 112 oz. silver and $4 to $14 gold per ton.

MOURGOUL RIVER COPPER CO., LTD. **RUSSIA.**

Offices: 3, Princes St., London, E. C., Eng. E. Fairweather, secretary.

Capital, nominal, £500,000. Was organized to take over sundry copper and silver-lead mines in the Mourgoul division of the Artoin district of the Russian Caucasus, but secretary writes that company has not yet acquired its property.

SOCIETE ANONYME DE MOUZAIA. **ALGERIA.**

Offices: 5, Rue St. Vincent de Paul, Paris, Xe., France. Mine office: Campdes Chenes, par Blida, department d'Alger, Algeria. E. Raschle, president: R. Lava, secretary; M. Duvialard, general manager. Organized 1898, with capitalization 350,000 fr. Lands, 5,362 hectares, showing 6 fissure veins in schists carrying chalcopyrite, and 10 contact veins carrying antimonial gray copper, veins ranging from 2cm. to 100cm. wide and averaging 4% to 5% copper, and from nothing to 27 oz. silver per ton. Mine is opened by a 17m. shaft and 7 tunnels of 39m. to 63m. length, in chalcopyrite, and by 12 tunnels, four longest 220m., 240m., 255m. and 265m., in gray copper ore. Mine is served by the West Algerian railroad, 2m. distant. Has been idle since 1899 but company plans developing hematite ore veins in 1904.

MOZUMI MINE. **JAPAN.**

Mine office: Kamioka-mura, Yoshiki-gori, Hida, Japan. An old property, opened 1573, near the Kamioka mine. Owned and operated by the Mitsu Bishi Gosshi Kwaisha. Is primarily a silver-lead mine, but secures a little copper as a by-product. Production for 1900 was only 8,475 lbs. refined copper, or about one-tenth as much as was secured three years previously.

LOS MUERTOS MINING CO. **MEXICO.**

Mine office: Velardeña, Durango, Mex. Carter Barker, superintendent. Ores carry copper, silver and lead. Has steam power and employs about 100 men.

MULOCK TRACT. **MICHIGAN.**

Office: care of R. P. Mulock, owner, Colfax, Iowa. Lands, 160 acres, being the northwest ¼ of Sec. 9, 49-41, near the Norwich mine, Ontonagon county, Michigan. A little exploratory work done in 1903, under the direction of Chas. Oley, showed 2 cupriferous lodes of 18″ to 36″ surface width, widening in depth, and a 10′ lode showing copper in a shallow test-pit, also an 8′ lode showing copper.

MUNGANA (CHILLAGOE) MINING CO., LTD. **AUSTRALIA.**

Offices: 39, Queen St., Melbourne, Australia, and Finsbury House, Blomfield St., London, E. C., Eng. Mine office: Chillagoe, Queensland, Australia. Harvey Patterson, chairman; C. L. Hewitt, secretary in Melbourne; E. Habben, secretary in London; E. J. Rodda, mine manager; Fredk. Back, superintendent. Organized March, 1901, under laws of Queensland, with capital £125,000, shares 5s. par. Lands, 5 leaseholds, area 271 acres, showing ores of copper, silver and lead. Mines are known as the Griffiths, developed by an 80′ open-cut; Calumet, opened by an 80′ shaft; Magazine, worked open-cast and by an 83′ shaft; Dorothy, an old mine opened by a 100′ shaft; Lady Jane, opened by an old 100′ shaft and a new 300′ three-compartment shaft, and Girofla, opened by a 100′ shaft. Mines are quite wet in the rainy season. Has steam power and a good mining plant. For year ending June 30, 1903, production was 630 tons of copper, 703 tons of lead and 62,769 oz. of silver, secured from 8,345 tons of copper ore and 3,073 tons of lead ore. In latter months of 1903 production ranged from 70 tons to 100 tons of refined copper, 10,000 to 12,000 oz. of silver and 150 to 250 tons of lead. Ore is reduced at the Chillagoe smelter. Profits for year ending June 30, 1903, were £8,586 3s. 4d. Extensive developments are contemplated for the near future. Property seems well managed and is one of the most promising in Queensland.

SUCESION JUAN MUNOZ. **CHILE.**

Office and mine: La Serena, Coquimbo, Chile. Has steam power and a small smelter, employing about 200 men.

MUNROE-THOMPSON ORE REDUCTION CO. **NOVA SCOTIA & QUEBEC.**

Office: 12 Pearl St., Boston, Mass. Mine office: Wentworth Centre, Cumberland Co., N. S. Employs about 20 men. Organized 1901, under laws of Maine, with capitalization $1,000,000, shares $1 par. E. R. Gregory, president; E. F. Morse, secretary; J. J. Reilly, treasurer and general manager; C. C. Munroe, superintendent. Lands, 15 square miles, at Wentworth Centre and Malagash Point, Cumberland county, Nova Scotia, and near Melbourne, Richmond county, Quebec, showing 15 ore bodies, of which 3 are being developed. Main ore body is a blanket formation, with estimated thickness 5′ and width 100′, with estimated average values of 7% copper and 2 oz. silver per ton. Has about 500′ of underground openings, with estimated ore blocked for stoping 100,000 tons. Has steam power and concentrator, with smelter at Wentworth Centre, one mile from mine, having a 150-ton water-jacket blast furnace, Blake crusher, 100-ton pulverizer, 100-ton rotary roaster for leaching plant, and 10 large lixiviation tanks. Mill and smelter plant include buildings of 25x100′, 25x50′, 30x75′ and 30x30′, with sundry outbuildings.

MUNSEY GROUP. **MEXICO.**

Mine office: Zacualpan, Mexico, Mex. Geo. W. Small, superintendent. Lands, 16 pertenencias, area about 40 acres, showing ores of silver, gold and copper. Employs about 20 men, in development.

MURRAY MINE. **ONTARIO.**

In the vicinity of Sudbury, Algoma, Ont. Opened 1892, closed 1894. Principal values are in nickel, with some copper. Ore body, said to average 70′ wide, is a massive pyrrhotite, carrying occasional pyrites, and rather low in grade.

MURRAY-ISABEL MINES CO. **COLORADO.**

Office and mines: care of W. H. Murray & Sons, owners, Parkdale, Fremont Co., Colo. Ores carry principal values in gold, silver and lead, with a little copper and zinc as by-products. Has steam power and concentrator, shipping concentrated ores direct to smelter. Employs 20 men.

MURRIN COPPER MINES., LTD. **AUSTRALIA.**

Offices: Winchester House, London, E. C., Eng. Mine office: Murrin Murrin, Western Australia. A. E. Barton, chairman; Chas. Taylor, general

NANCY HANKS MINE. **MONTANA.**

Mine office: Garnet, Granite Co., Mont. Samuel I. Ritchie, owner. Ores carry gold, silver and copper. Has steam power. In litigation.

NANTLLE VALE COPPER MINING CO., LTD. **WALES.**

Offices: 11, Dale St., Liverpool, England. Mine office: Llanllyfin, Carnarvon, Wales. O. A. Harling, chairman; W. H. Hill, secretary. Capital, nominal, £5,000; debentures, £7,500, protected by first, second and fourth mortgages.

NAPA COUNTY COPPER MINING CO. **CALIFORNIA.**

Office: 1206 Market St., San Francisco, Cal. Owen Wade, president; F. J. Taylor, secretary and treasurer. Organized August 22, 1902. Lands, 13 miles south of Middletown,Napa Co., Cal., developed by a 400′ tunnel.

NAPOLEON MINE. **CALIFORNIA.**

Mine office: Copperopolis, Calaveras Co., Cal. Owned by Josephine H. Sullivan. Under bond to Lewis and Ben Williams. Is the oldest copper mine in California, and was once a considerable producer. Vein channel is 100′ wide and ranges from diabase to talcose schist, ore bodies occurring in lenses up to 20′ wide. Ores are principally sulphide, with a fair sprinkling of carbonates and oxides. Old shaft, 325′. New shaft is being sunk to westward. Considerable copper has been produced latterly by leaching the old dumps.

NASHVILLE MINE. **COLORADO.**

Letter returned unclaimed from Idaho Springs, Clear Creek Co., Colo.

NATIONAL COPPER CO. **VIRGINIA.**

Mine office: Garrisonville, Stafford Co., Va. Supposed to be working deposits of cupriferous iron pyrites.

NATIONAL COPPER MINING CO. **UTAH.**

Office: 400 D. F. Walker Bldg., Salt Lake City, Utah. Capitalization $100,000, shares 10c. par. F. E. Smith, president; W. H. Tibbals, vice-president; C. E. Peyton, secretary and treasurer. Lands, about 115 acres, in the La Sal Mountains, Sonoma district, Grand county, Utah. Ore assaying 9.5% copper, with traces of gold and 17.5 oz. silver per ton, has been taken from a fissure vein traversing sandstone.

NATIONAL COPPER MINING CO. **WYOMING.**

Office: Douglas, Carbon Co., Wyo. Incorporated July, 1902, with capitalization $250,000. Frank Tinkham, president; G. W. Johnson, secretary; H. C. Paul, general manager. Lands, sundry claims near Guthrie, Wyoming.

NATIONAL GOLD & SILVER MINING CO. **NEW MEXICO.**

Mine office: Stein's Pass, Grant Co., N. M. B. L. Berkey, superintendent. Installed a 50-ton concentrator late in 1903.

NATIONAL METAL CO. **MEXICO.**

Office: Guadalajara, Mex. Has smelting plants at Guadalajara and at Ameca, Jalisco, Mexico.

NATIONAL MINING CO. **CALIFORNIA.**

Office: Tacoma, Wash. Mine office: Waldo, Ore. Property is the

Sanger group of 35 claims, area 700 acres, in Del Norte county, California, a few miles south of Waldo. Capitalization $10,000,000. S. J. Pritchard, president; Geo. P. Larsen, secretary; John Sanger, superintendent. Also has oil lands in western Washington and several mining claims in the lower Arrow Lake district, British Columbia. The Sanger ores give good assay values in copper and gold, and company is said to plan construction of a smelter.

NATIONAL MINING CO. **MICHIGAN.**

Office: 15 Congress St., Boston, Mass. Mine office: Rockland, Ontonagon Co., Mich. Organized 1878, with capitalization $2,500,000; issued, $1,875,000. Paid in, $3.20 per share. John C. Watson, president; Daniel L. Demmon, secretary and treasurer. Lands adjoin the old Minnesota mine, now owned by the Michigan Copper Mining Co. Has produced nearly 6,000 tons of copper, and has paid dividends of $320,000. Idle since 1893. Fully described in Vol. II.

NATIONAL SMELTING CO. **SOUTH DAKOTA.**

Office, mine and works: Rapid City, Pennington Co., S. D. Mines ores carrying gold, silver and copper, latter being secured as a by-product. Has a large smelter and employs about 200 men.

NATIONAL SMELTING & REFINING CO. **NEW MEXICO.**

Mine office: Lordsburg, Grant Co., N. M. Has a 50-ton smelter, built 1903, on the Aberdeen property, and has a contract to smelt ores of that mine.

NATIONAL CAPITAL COPPER CO. **MEXICO.**

Office: 1901 Seventh St., N. W., Washington, D. C. Mine office: Coapa, Michoacan, Mex. Henry M. Baker, president and treasurer; Francis M. Criswell, secretary; Samuel W. Scott, general manager. Organized Apr. 23, 1902, under laws of Virginia, with capitalization $150,000, shares $1 par. Lands, 550 pertenencias, area about 1,375 acres, in the Tacambaro district, showing 6 contact veins between granite and limestone, carrying native copper and argentiferous and auriferous oxide, carbonate and sulphide ores. Two veins are being developed by tunnels, the Confianza veins being said to be 70′ wide. Nearest railway is the Mexican National, 45 miles distant. Property has ample water available, and is well timbered.

LA NATIVIDAD MINING CO. **MEXICO.**

Office: care of J. B. Quinn, president, 69 Wall St., New York. Company moved from former office, 17 Park Row, New York, and left no address. Letter returned unclaimed from former mine office, Coapa, Michoacan, Mexico. Capitalization $1,500,000, shares $10 par. M. L. Ward, secretary and treasurer. Lands, 100 pertenencias, area 247 acres, adjoining the Donna Luisa and Santa Emilia mines. Company makes exaggerated claims regarding value of its property.

NAVERFJORD MINES. **NORWAY.**

Mine office: Naverfjord, Norway. Production in 1902 was 160 tons of first-grade and 1,500 tons of second-grade ore, containing metallic values equal to about 180 tons of refined copper.

NELSON COPPER FIELDS, LTD. **BRITISH COLUMBIA.**

Offices: 57, Moorgate St., London, E. C., Eng. Mine office: Nelson, B.C. H. Shepherd Cross, chairman; C. S. Good, secretary. Capital, nominal, £100,000. Lands, 344 acres, on Morning Mountain. Idle since 1900.

GEWERKSCHAFT NEUE-KIRCHE. **GERMANY.**

Mine office: Gross-Schliefensteinthal bei Goslar, Hárz, Germany.

C. NEUMANN & CO. **CAPE COLONY.**

Are developing copper mines in Little Namaqualand, Cape Colony.

NEVADA CONSOLIDATED COPPER & GOLD MINING & MILLING CO. **NEVADA.**

Office: 506-31 State St., Boston, Mass. Mine office: Yerington, Lyon Co., Nev. Organized under laws of Maine, with capitalization $1,000,000, shares, $1 par. Jas. P. Niles, president and general manager; Horace P. Hunt, secretary; Jas. D. Niles, treasurer. Lands, 18 copper claims in Lyon county and 12 gold claims in Lincoln county, Nevada, former including the Bunker Hill and Redemption groups. Has electric power and a 50-ton smelter.

NEVADA CONSOLIDATED SMELTING & REFINING CO. **NEVADA.**

Office: 201 Exchange Bldg., Denver, Colo. Works office: Pioche, Lincoln Co., Nev. Wm. Gelder, manager. Has a 200-ton smelter and 22 miles of narrow-gauge railroad. Is closely affiliated with the Hillside Copper Co.

NEVADA COPPER CO. **NEVADA.**

Merged in Nevada Bell Copper Mining & Reduction Co.

NEVADA DEVELOPMENT CO. **NEVADA.**

Office: 201 Walnut Pl., Philadelphia, Pa. Mine office: Lovelock, Humboldt Co., Nev. Theo. H. Lowe, superintendent. Lands include the Copper Glance and adjoining claims.

NEVADA GOLD & COPPER MINING CO. **NEVADA.**

Office: Parrot Bldg., San Francisco, Cal.

NEVADA BELL COPPER MINING & REDUCTION CO. **NEVADA.**

Office: 850 Drexel Bldg., Philadelphia, Pa. Mine office: Lovelock, Humboldt Co., Nev. Organized 1902, under laws of Nevada, with capitalization $5,000,000, absorbing the Nevada Copper Co. and the Bell Mare Mining & Smelting Co. C. W. Sweitzer, president; H. H. Barbee, vice-president; A. P. Platt, secretary and treasurer. Lands, about 500 acres, on which considerable development has been secured. The 500′ Bell Mare tunnel is to be driven 1,500′, to cut the vein found in the Copper King tunnel. Ore bodies are said to be large, but of low grade, averaging about 4% copper, and occurring as replacements in a formation of andesitic porphyry. Has good power equipment and a 60-ton smelter built by the Nevada Copper Co., which it is planned to replace with much larger furnaces.

NEW AMERICAN MINING & MILLING CO. **UTAH.**

Mine office: Brigham, Box Elder Co., Utah.

NEW ARIO COPPER & EXPLORATION CO., LTD. **MEXICO.**

Offices: 31, Lombard St., London, E. C., Eng. Mine office: Ario, Michoacan, Mex. J. Hendrick, managing director; F. Richards, secretary. Capital, nominal, £100,000, shares 4s. par. Mine idle at last accounts.

NEW BALLA BALLA COPPER MINES, LTD. **AUSTRALIA.**

Offices: Great St. Helen's, London, E. C., Eng. Mine office: Port Balla Balla, Western Australia. T. W. Williams, chairman; E. A. Foster, secretary; A. Harding, legal manager in Western Australia. Capital, nominal, £250,000; issued, £183,675. Lands, 120 acres, in two groups, in the Pilbarra distant, 11 miles from Port Balla Balla, and one mine 50 miles distant. Has a 30-ton smelter.

NEW BOSTON MINING CO. **MONTANA.**

Office: Eden Valley, Minnesota. Mine office: Corbin, Jefferson Co., Mont. Ores carry gold and copper.

NEW CALEDONIA COPPER CO., LTD. **NEW CALEDONIA.**

Reorganized as Caledonia Copper Co., Ltd.

NEW CHILLAGOE RAILWAY & MINES, LTD. **AUSTRALIA.**

Offices: Finsbury House, London, E. C., England and 39, Queen St., Melbourne, Australia. Mine office: Chillagoe, Queensland, Australia. Employs about 150 men. Chas. Wm. Chapman, chairman; Fredk. Back, managing director; T. J. Greenway, general manager; Edwin Habben, secretary in London; C. L. Hewitt, secretary in Melbourne; G. Smith, mine manager. Organized 1902, under laws of Victoria, as a reconstruction, with capital, nominal, £1,000,000; issued, £748,218. Debentures, £498,300 at 6%. Property is railway and mineral concessions, granted by the Queensland government. The railroad of 102 miles runs from Mareeba to Chillagoe. Mineral concessions are 9 groups of 70 leases, area about 2,000 acres, held on 50-year lease from Jan. 1, 1898, at an annual rental of £1 per acre, with exemption from labor conditions, also about 1,200 acres of ordinary mineral leases. Is the parent company of the Mungana (Chillagoe) Mining Co., Ltd. Operations of previous management were not successful, but matters now seem to be going more smoothly. Principal mining properties are the Penzance, Zillmanton, Queenslander, McIlwraith, Harper, Hobson and Boomerang, of which the two first named are the more important, the Penzance showing a good body of 5% to 8% ore.

The smelter has one lead furnace and 5 copper furnaces, of about 50 tons daily capacity each. Blowers are driven by steam engines and an electric plant. Installation of a converter plant is planned. Ore is exchanged with the Mungana company, giving better fluxing mixtures to both, and the Mungana ores are also smelted by this plant. Water is furnished by a 1,500,000-gallon dam across Chillagoe Creek, this stream having a minimum flow of about 4,000 gallons per hour. Production in 1902 was 402 long tons of copper and 23,972 oz. of silver. In September, 1903, production was 88 tons of copper and 5,491 oz. of silver, in addition to copper, lead and silver smelted for the Mungana company. Output for 1903 was probably about 2,000,000 lbs. of blister copper. Cost of smelting is about $3.75 per ton. Property has been developed and equipped under serious disadvantages, but is possessed of merit, and the present management seems to be securing good results.

NEW CLONCURRY COPPER & SMELTING CO., LTD. **AUSTRALIA.**

Offices: 116, St. Vincent St., Glasgow, Scotland. R. L. Alston, chairman; D. F. G. Meldrum, secretary. Capital, nominal, £3,300. Lands, sundry small mines in North Queensland, which are idle.

NEW COLUMBIA MINING CO. **IDAHO.**

Mine office: Salmon, Lemhi Co., Idaho. H. Armstead, superintendent. Ores carry copper and gold. Has steam power and a 10-stamp mill.

NEW ENGLAND GOLD & COPPER MINING CO. **UTAH.**

Office: 421-53 State St., Boston, Mass. Mine office: Bingham Canyon, Salt Lake Co., Utah. Employs about 25 men. Organized 1899, under laws of Colorado, with capitalization $1,000,000, shares $1 par. D. W. Williams, president; Thos. Kellough, vice-president; Geo. F. Bradstreet, secretary and treasurer; S. W. West, general manager; H. M. Adkinson, superintendent; Col. E. A. Wall, engineer. Lands, 7 claims, area 27 acres, in the West Mountain district, showing 2 fissure veins of 3′ average width carrying auriferous and argentiferous sulphide ores of copper and lead, estimated by company to average $35 per ton in value. Development is by 7,800′ of tunnels and drifts. Has a steam plant and contemplates building a combination mill, at the Nast mine, to treat silver-lead and copper ores.

NEW ENGLAND MINING CO. **MASSACHUSETTS.**

Office: 35 School St., Greenfield, Mass. Mine office: Charlemont, Franklin Co., Mass. Othello A. Fay, president; Capt. Geo. H. Davenport, treasurer and general manager. Organized 1902, with capitalization $500,000, shares $5 par. Lands, about 1,000 acres, 2 miles west of the Davis pyrite mine worked since circa 1880. Vein is approximately vertical, conforming closely in dip and strike with the Savoy schist in which it occurs, and is apparently a fahlband, lacking well-defined walls, the ore occurring scattered through 15′ to 20′ of the schist with a 6″ to 1′ vein of quartz, well mineralized on the south wall, and a heavy impregnation of chalcopyrite 1′ to 2′ wide on the north wall. Is opened by crosscutting and stripping, with vein traced about 700′.

NEW ENGLAND & ARIZONA COPPER & GOLD MINING CO. **ARIZONA.**

Mine office: McCabe, Yavapai Co., Ariz. Edmund D. Fisk, president; John A. Thompson, secretary and treasurer; C. M. Egge, superintendent. Organized under laws of Arizona. Lands, 5 claims, known as the Red Star group, near the Silver Belt mine, in the Big Bug district. Has steam hoist and about 300′ of underground openings.

NEW ENGLAND & CLIFTON COPPER CO. **ARIZONA.**

Office: care of E. Rollins Morse, president, 43 State St., Boston, Mass. Mine office: Clifton, Graham Co., Ariz. Arthur P. Ayling, general manager; C. C. Burger, consulting engineer. Capitalization $5,000,000, in $2,000,000 preferred 8% stock, cumulative after payment of first 8% dividend, and $3,000,000 common stock, with $1,000,000 preferred and $500,000 common stock unissued. Absorbed the New England Copper Co. and the Clifton Consolidated Copper Mines of Arizona. Lands, 77 claims, with about 13,000′ of underground openings in the two mines. The Clifton has 7 shafts of 70′ to

315′, also tunnels of 220′, 450′, 700′, 800′, 1,000′ and 1,700′, showing principally chalcopyrite and chalcocite, with occasional oxides and carbonates, all slightly auriferous and argentiferous. Plans of former management of the Clifton called for the driving of a 7,700′ drainage and operating tunnel, to have double tracks and electric haulage. The New England is opened by shafts of 400′ and 500′ and a 2,000′ tunnel, showing fissure veins instead of the blanket veins noted at Clifton, 3 miles distant. Principal vein is 5′ to 6′ wide, carrying cuprite, chalcocite and chalcopyrite, all of very high grade, this ore being among the richest found in the Clifton district in quantities of commercial importance.

The present company was organized by very strong people, including several directors of the Calumet & Hecla, and the company plans extensive development. Probably $1,000,000 or more will be needed to put the company on a satisfactory productive basis, and about two years will be required in the work.

NEW ENGLAND-UTAH MINING CO. UTAH.

Office: 601 Journal Bldg., Chicago, Ill. Mine office: Bingham Canyon, Salt Lake Co., Utah. Organized 1901, under laws of Delaware, with capitalization $1,250,000, shares $1 par. Don M. Dickinson, president; Chas. J. Hodge, secretary and treasurer; Morris R. Hunt, general manager; E. M. Eakin, mine superintendent; Edw. Cutler, mill superintendent; E. P. Jennings, engineer. Lands, 13 claims, area 115 acres, formerly known as the Last Chance mine, in the Bingham divison of the West Mountain district, showing fissure and contact veins of 3′ to 50′ width, giving good assay values in copper, lead, silver and gold. Has 7,000′ of tunnels and about 2 miles of underground openings. Equipment includes a 125-h. p. boiler, 60-h p. engine and 100-ton concentrator equipped with crusher, rolls, Chilean mill, Hodge jigs and concentrating tables. Property is well located and regarded as valuable.

NEW HIGHLAND GOLD & COPPER MINING CO. CALIFORNIA.

Office: 1209 Broadway, Oakland, Cal. Mine office: Georgetown, El Dorado Co., Cal. Employs 12 men. Organized, Sept. 11, 1903, under laws of California, with capitalization $2,000,000, shares $1 par. Thos. F. Graber, vice-president; C. L. Colvin, secretary and treasurer; Ira C. Jenks, financial secretary. Lands, 11 copper claims and 9 gold claims, area 555 acres, on the Mother lode, in the Georgetown district, showing a fissure vein in slate giving assays of 15% copper, 15 oz. silver and $2.50 gold per ton.

NEW JERSEY METAL REFINING WORKS, LTD. NEW JERSEY.

Works office: Elizabeth, N. J. Owned by the Mountain Copper Co., Ltd.

NEW LONDON COPPER MINES. MARYLAND.

Office: care of Capt. Edw. S. Wertz, owner, Washington, D. C. Property is in Frederick county, Maryland. Was worked from 1835 to 1855 at a profit, but later purchasers became involved in litigation and property has been idle since circa 1888. Proberty includes 64 acres of mineral land and 14 acres of timber land. Mine shows a contact vein of 3′ to 4′ between slate and limestone, giving assays of 3.5% to 70% copper. Has 4 tunnels, longest 104′

and a 210′ shaft, with about 500′ of underground openings. Present owner purposes draining and reopening mines in spring of 1904.

NEW MAMMOTH MINING & MILLING CO. UTAH.

Mine office: Bingham Canyon, Salt Lake Co., Utah. J. E. Beveridge, superintendent, at last accounts. Ores carry gold, silver and copper. Has steam power.

NEW MEXICO COPPER MINING & SMELTING CO. NEW MEXICO.

Letters returned unclaimed from former office, Hartford, Conn., and former mine office, Lucera, Mora county, New Mexico.

NEW MEXICO DEVELOPMENT CO. NEW MEXICO.

Mine office: Fierro, Grant Co., N. M.

NEW MEXICO GOLD & COPPER MINING CO. NEW MEXICO.

Office: 39 Cawker Bldg., Milwaukee, Wis. Mine office: Tres Piedras, Rio Arriba Co., N. M. Employs 8 men. Organized 1897, under laws of New Mexico, with capitalization $2,500,000, shares $1 par. Wm. H. Devos, president; M. D. Kelly, secretary and treasurer; Richard Cole, superintendent. Lands, 11 claims, area 140 acres, in the Bromide district, showing fissure veins in schists and contact veins between schist and granite. Five veins are being developed, these averaging 7′ in width and giving assays of 5% to 40% copper and occasional high values in gold, from native copper, carbonate and sulphide ores. Has a 130′ shaft and 265′ of underground openings, with steam power and Norwalk air compressor. Will sink and drift during 1904.

NEW MICHIGAN COPPER MINING CO. WYOMING.

Office: Laramie, Wyo. John M. Arthur, superintendent.

NEW MOUNT HOPE COPPER MINING CO., LTD. AUSTRALIA.

Mine office: Mt. Hope, N. S. W., Australia. R. M. Kirk, general manager. Is located about 90 miles south of the Great Cobar mine. Mine opened 1878, with production of 131 long tons refined copper in 1898, and total production of 5,070 tons of refined copper to that time. Deepest shaft is 400′. Ores are mainly chalcopyrite and bornite, with sandstone gangue, in a country rock of ferruginous slates and sandstones, with oxidized ores mainly earthy carbonates above the 250′ level. Ore bodies occur as replacements in the country rock, without defined walls, having an extreme width 80′. General formation and physical features resemble the Great Cobar mine. Ore is concentrated about 5 into 1, and is smelted in a plant having 5 small furnaces, using iron ore secured 12 miles distant for a flux.

NEW RIO TINTO COPPER CO., LTD. SPAIN.

Absorbed by Caridad Copper Co., Ltd.

NEW RIVER COPPER CO.

Organized August, 1902, under laws of Delaware, with capitalization $1,000,000. Location of property, if any, unknown.

NEW SLEEPY HOLLOW GOLD MINING CO. COLORADO.

Mine office: Black Hawk, Gilpin Co., Colo. John F. Hopkins, superintendent. Ore carries gold, silver and copper. Has steam power and employs about 20 men.

NEW YELTA COPPER MINING & SMELTING CO., LTD. **AUSTRAL**

Mines sold to Paramatta Copper Mines, Ltd.

NEW YORK GROUP. **ARIZO**

Mine office: care of T. R. Nellis, owner, Williams, Coconino Co., A

NEW YORK MINE. **ARIZO**

Office: care of Harry J. Bennett, owner, Phoenix, Ariz. Mine offi Morristown, Maricopa Co., Ariz. Has a 100′ shaft on a 3′ vein, also a vein giving assays of 60% copper.

NEW YORK COPPER MINING & SMELTING CO. **ARIZO**

Office: Tucson, Ariz. Mine office: Vails, Pima Co., Ariz. F. H. L president; E. J. Tripple, secretary; H. Buehman, treasurer. Lands, 6 clai in the Helvetia district, on which a small force is employed in developm work.

NEW YORK-ALASKA MINE. **ALAS**

Office: care of Saml. Silverman, general manager, Ketchikan, Ala Property is near the Brown-Alaska, on Prince of Wales Island.

NEW YORK & ARIZONA COPPER MINING & SMELTING CO. **ARIZON**

Office: 261 Broadway, New York. Letter returned unclaimed from former mine office, Globe, Gila Co., Ariz. Organized 1901, with capitalization $3,000,000, shares $10 par, apparently with the sole object of selling stock. Lionel Hagenaers, president; E. G. Macqueston, secretary. Property is considered promising but will never be made a mine by the present company, which is of that numerous class of stock-jobbing flotations, promoted by eastern parties on Arizona lands, that greatly injure the many legitimate mining enterprises of that territory.

NEW YORK-CANADIAN COPPER CO., LTD. **ONTARIO.**

Office: Port Arthur, Ont. Mine office: Kashaboiwe, Rainy River district, Ont. Employs 30 men. Capitalization $1,000,000, shares $10 par. W. G. Pollock, president; Peter L. Kimberly, vice-president; Harry Folger, secretary and treasurer; B. W. Folger, general manager; Tom R. Jones, superintendent. Lands, 4 claims, area 365 acres, 6 miles from Kashaboiwe, on Round Lake, Moss Twp., Thunder Bay district, showing 3 contact veins between diorite and schist, of which the two under development average 25′ width and are opened by shafts of 50′ and 208′, giving average assays of 7% copper, 1.5 oz. silver and 60c. gold per ton, with about 50,000 tons of ore in sight and about 4,000 tons on the dumps. Has a 120-h.p. steam plant, with hoist and 5-drill Ingersoll-Sergeant air compressor. Company plans erecting a 50-ton smelter in 1904. Is vigorously managed, with adequate capital, and is the most promising copper property on the northern shore of Lake Superior.

NEW YORK & MONTANA COPPER MINING CO. **MONTAN**

Mine office: Corbin, Jefferson Co., Mont. Organized 1903, under law of Delaware, with capitalization $1,000,000. Has shafts of 50′, 60′ and 134′, with indications of a large body of low-grade ore.

IEW YORK & NEVADA COPPER CO. **NEVADA.**

Office: 25 Broad St., New York, N. Y. Mine office: Ely, White Pine 'o., Nev. Organized 1902, under laws of New Jersey, with capitalization 5,000,000, shares $10 par. Mulford Martin, president; Joshua R. Clair, ecretary and treasurer; Walter T. Hook, general manager; Saml. W. Traylor, onsulting engineer. Lands, 28 claims, area 500 acres, also a 100-acre mill-ite and 2,700 acres of agricultural lands, at Copper Flat, in the Robinson istrict, showing numerous fissure veins, of which 3 are developed by 30 hafts of 10′ to 450′ depth, with about 6,000′ of underground openings, estimated by company to show 300,000 tons of ore blocked for stoping. Ore s mainly chalcopyrite and chalcocite, with occasional oxides and carbonates, nd gangue of quartz-porphyry, averaging about 3% copper with traces f silver and $1 gold per ton. Has steam plant with one large duplex hoist nd two small single-drum hoists, and has water power available for development. Has a 500-ton concentrator with rolls, impact screens and Bartlett ables, also a 200-ton smelter, at Keystone, 2½ miles from mine, with railroad onnection. Smelter has one 42x120″ blast furnace, with 56″ U-pipe hot-blast stove, Corliss engine and blower, making 55% matte when operated. Nearest railway is 70 miles distant. Property was attached by W. B. Graham nd the Eureka & Palisade Ry. Co., late in 1903, and while regarded as eritorious, lack of rail connections and funds renders the future of the ine doubtful.

EW YORK-SEATTLE COPPER MINING CO. **WASHINGTON.**

Office: care of C. F. Oliver, president, Hoboken, N. J. Mine office: dex, Snohomish Co., Wash. R. H. Hingston, superintendent. Property aid to show a 20′ vein of copper ore traceable 500′, developed by tunnel. mpany plans building a concentrator.

W YORK & VIRGINIA COPPER CO. **VIRGINIA.**

Office: 149 Broadway, New York. Mine office: Woltz, Carroll Co., Organized 1901, under laws of West Virginia, with capitalization 0,000, shares $1 par. Ambrose C. Dunn, president and general manager; D. Boggs, secretary and treasurer; James Lawson, superintendent. , 740 acres, showing 7 cupriferous fissure veins and 2 gold veins, with er veins developed by shafts of 100′ and 130′ and 2 tunnels of 100′ Largest vein said by company to average 96′ width and to show ferous melaconite, bornite, and chalcopyrite carrying 10% copper, ilver and 1 oz. gold per ton. Has steam power. Probably idle.

UNDLAND COPPER CO., LTD. **NEWFOUNDLAND.**

orbed by Carmen Copper Mines, Ltd.

GASS & CO. **SPAIN.**

e: 7, Lothbury, London, E. C., Eng. Lands, sundry silver-gold-ines, at Arrieta and Changoa, Navarra, Spain.

E MINE. **CONNECTICUT.**

ld property at Granby, Hartford Co., Conn. Was worked at eriods during the past century, but long idle.

NEWHOUSE MINES & SMELTER CO. **UTAH.**

Office: 522-52 Broadway, New York. Mine office: Frisco, Beaver Co., Utah. Employs about 50 men. Organized May, 1903, under laws of New York, with capitalization $6,000,000, apparently succeeding the Cactus Smelting & Mining Co. Is said to plan a $1,500,000 6% first-mortgage bond issue. Saml. Newhouse, president; A. J. Bettles, general manager; R. Stingley, superintendent; Jos. Dederichs, mill superintendent; Geo. K. Fischer, consulting metallurgist and mechanical engineer. Lands are in Copper Gulch, 7 miles from Frisco, including the Cactus group, on which has been platted the townsite of Newhouse. Ores are auriferous and argentiferous and of high grade, running up to 25% copper in considerable quantities. Lands carry upwards of a mile of the strike of the great Cactus vein, which has been opened to a depth of 700′ and is claimed to show 2,000,000 tons of ore blocked out for stoping. Is driving a 5,800′ tunnel, about 2,000′ long at end of 1903. A large concentrator, designed by Robt. F. Moser, is to be built in 1904. Has steam, gasoline and electric power, with electric lights. Water for the concentrator is to come from a storage reservior at Wah Wah Springs, built 1903, connected with the millsite by a 9-mile 14″ pipe line. A smelter-site was selected, but will not be utilized in the near future, as the company has contracted to furnish $10,000,000 worth of smelting ore and concentrates to the American Smelting & Refining Co. plant at Murray, Utah.

This property has gone under several different titles during the past few years, and several false starts have been made in development, but the present work is in earnest, and as the property is both large and rich, the Newhouse should become a considerable producer in the near future.

NEWS COPPER MINING CO. **ARIZONA.**

Office: care of F. August Heinze, Butte, Mont. Property is a group of claims near the United Verde mine, at Jerome, Yavapai county, Arizona.

NEWS BOY COPPER MINING CO. **WYOMING.**

Mine office: Encampment, Carbon Co., Wyo.

NEWTON COPPER CO. **CALIFORNIA.**

Office: 420 Montgomery St., San Francisco, Cal. Mine office: Ranlett, Amador Co., Cal. Idle. Organized 1887, under laws of California, with capitalization $200,000, shares $5 par. Horace D. Ranlett, president and general manager. Lands, 100 acres, patented, showing 3 fissure veins in slate, carrying an average of 8% copper, mainly in sulphide ores. Mine was opened 1861 and has shafts of 200′ and 430′, with about 20,000 tons of ore in sight. Has steam power, and smelter with an 80-ton water-jacket blast furnace making 50% matte, also a 100-ton leaching plant, ore being especially adapted to lixiviation.

NIAGARA COPPER CO. **ARIZONA.**

Office and mine: Prescott, Yavapai Co., Ariz. Herman Voge, president; John P. Bauder, secretary. Lands are in the Copper Creek district, near the Hillside property, and show what is apparently a considerable body of low-grade ore.

NIAGARA MINING & DEVELOPMENT CO. **BRITISH COLUMBIA.**

S. Arden Singlehurst, manager. Has been exploring in Kitsalas Canyon, on the Skeena river, in the extreme northern part of British Columbia, near the Alaskan line.

NIAGARA MINING & SMELTING CO. **UTAH.**

Mine office: Bingham Canyon, Salt Lake Co., Utah. Property supposed to be valuable, but company in financial straits.

NICHOLS CHEMICAL CO. **QUEBEC.**

Office: 25 Broad St., New York. Mine office: Capelton, Sherbrooke Co., Quebec. Works office: Laurel Hill, N. Y. W. H. Nichols, president; J. B. F. Herreshoff, vice-president; J. M. Luther, secretary; E. R. Nichols, treasurer; S. L. Spofford, mine manager. The Capelton property has 640 acres, carrying lenses of chalcopyrite and iron pyrites, former averaging 5% copper and 38% sulphur, developed by 6 shafts, 4 of less than 500′, one of 800′ and one of 2,000′, with about 5 miles of underground openings. Has steam power, 150-ton concentrator, and smelter turning out 50% matte, employing about 100 men. At the Laurel Hill works the company has a smelter and 120-ton electrolytic copper refinery, using steam and electric power and employing about 250 men. In 1902 this plant received 35,538 long tons of copper ore from Newfoundland.

NICKEL COPPER CO. **ONTARIO.**

Office: Worthington, Ont. Lands are in Drury Twp., near Sudbury, Algoma, Ont. Has been experimenting with a new process of reducing nickel-copper ores, with usual result of failure. Lands thought to be vaulable, but company has not been well managed.

NICKEL PLATE MINE. **BRITISH COLUMBIA.**

Mine office: Hedley, B. C. Owned by Rogers Bros., et al. A. Munson, manager. Ores carry gold, silver and copper. Has water and electric power and 40-stamp mill.

NIGHT HAWK MINING CO. **WASHINGTON.**

Office: 201 Uihlein Bldg., Milwaukee, Wis. Mine office: Loomis, Okanogan Co., Wash. Employs 10 to 15 men. Organized 1901, under laws of Washington, with capitalization $5,000,000, shares $1 par. A. M. Wehe, president and general manager; H. D. James, secretary and treasurer; A. Geo. Wehe, superintendent. Lands, 65 claims, area 1,350 acres, also 150 acres miscellaneous lands including millsite and townsite, on Mt. Ellemeham, in the Wannacut Lake district, showing numerous fissure veins, of which 5 are being developed, these ranging 6′ to 10′ in width and giving estimated average values of 8% copper and 1 oz. gold per ton. Development is by 2 shallow shafts and 2 short tunnels.

NIGHTHAWK MINING & TUNNEL CO. **WASHINGTON.**

Mine office: Conconully, Okanogan Co., Wash. Is developed by a 1,150′ tunnel.

NIPPER CONSOLIDATED COPPER CO. **MONTANA.**

Office: 31 Nassau St., New York. Mine office: Butte, Silver Bow Co., Mont. Employs about 250 men. Capitalization, $3,750,000. Bonded to the southwest, with diorite dykes on either side of the wall rocks. Ores are auriferous and slightly argentiferous, carrying about $1.50 gold per ton. At an average depth of 40′ carbonate ores are replaced by bornite and chalcopyrite. Test shipments to the Omaha smelter of carefully selected ore gave returns of 30% to 45% copper and $2 to $9 gold per ton, with a little silver. The Ferris-Haggarty has a 250′ main shaft, with 2 levels opened, and is connected with a 390′ main tunnel by upraises. The deepest working, 530′ below the outcrop, is in a 50′ winze from the tunnel, showing considerable melaconite at depth, which is indicative of great persistence in copper values. The vein averages about 20′ width and the grade of ore is probably 6% to 8%, the mine being said to show upwards of 250,000 tons of ore. Underground haulage is by compressed air locomotives, and the advisability of working the mine on the caving system has been considered. The mining plant is located near the mouth of the tunnel, the mine having 3 compressed-air hoists and a 25-drill air compressor.

The smelter, at Encampment, is 16 miles from the mine, and connected therewith by a Leschen aerial tramway, which is the longest installation of the sort ever made. The tram is built in 4 sections of 4 miles each, and is operated by steam power, generated at 3 stations, 4 miles apart, each station having storage bins. The length of cables is 293,275′; weight of cables, 439,669 lbs.; number of tension stations, 16, four being double; greatest elevation above sea level is 10,690′ on Bridger Peak; highest tower, 69′; number of towers, 170; highest span, 250′ above ground at Heaning's Gulch; longest span, 2,200′ across Cow Creek Canyon; general rise, 900′; number of buckets, 840, capacity 700 lbs. each; speed 4 miles per hour; maximum daily capacity, 984 tons. Plant has automatic filling and discharging devices and was built so that its capacity can be easily doubled.

The 300-ton concentrator puts about 3 tons into 1, delivering concentrates averaging about 25% copper to the smelter, on the west branch of the Grand Encampment river, which has a sampling mill, 100-ton Davies calcining furnace, 40-ton straight-line mechanical roaster and two 250-ton water-jacket furnaces, with 2 converter stands, operated electrically, a 20-ton electric crane, briquetting plant for fines and flue dust, and a silica mill, the linings, which require replacing after every second charge, being made of mixtures of quartz and clay. Blowers for blast and the air compressor for converters are driven by water power, with electric power for cranes, slag line and other uses. A 23′ dam on the South Fork of the Grand Encampment river, 4 miles from the smelter, gives water through a 48″ wooden pipe-line, developing 1,200 h. p. and driving 5 wheels, two being direct connected by shafting and rope-drive with the concentrating machinery and the other three used to generate electricity. Fuel is lignite of fair quality, taken from the company's mines at Carbondale, 12 miles from Encampment, on the line of the aerial tram, over which it is delivered.

The smelter was given a trial run in 1903, turning out several hundred tons of 99% blister copper. At the close of the year the smelter was out of blast and mining was practically suspended, but arrangements had been made for an early resumption on a considerable scale, and the company plans beginning regular production in the spring of 1903. The management has made some mistakes, but nothing especially serious, and only what is common to most new mines. Development of the mine and equipment of the concentrator and smelter have been accomplished under great odds, all freight having been hauled 55 miles by team. The property is good and the management energetic, hence the North American Copper Co. promises well, and the property should become a considerable producer in 1904.

NORTH AMERICAN EXPLORATION CO. ARIZONA.

Mine office: Gilbert, Yavapai Co., Ariz. Geo. W. Middleton, superintendent. Ores carry gold and copper. Has gasoline power.

NORTH AMERICAN MINING CO. NEW MEXICO.

Office: 615 Commercial St., Shamokin, Pa. Mine office: Lordsburg, Grant Co., N. M. Employs 8 men. Thos. A. Lister, president and general manager; W. P. Caldwell, secretary; Daniel W. Briel, superintendent. Organized under laws of New Mexico, with capitalization $1,200,000, shares $2 par. Lands, 9 claims, area 155 acres, in the Virginia district, showing fissure veins in porphyry carrying oxide, carbonate and sulphide ores giving assays of 18% copper, 15 oz. silver and $10 gold per ton. Main shaft is 210′, on the Cobra Negra property. Has steam power, necessary mine buildings and 4 dwellings, with railroad 4 miles distant.

NORTH AMERICAN MINING CO. OREGON.

Office: Des Moines, Ia. Mine office: Burkemont, Ore. Organized 1898, with capitalization $1,500,000, shares $1 par. Thos. Burke, president and general manager; S. S. Cole, secretary and treasurer. Mineral lands, 807 acres, also 920 acres miscellaneous lands, in the Burkemont district. Main shaft, 300′. Company makes the modest claim in its advertisement that its copper ledge is 1,000′ wide and over a mile long, giving assays of 6% to 8% copper, with gold and silver values. Employs 10 to 15 men, with which force the ore body described will last a long time before being exhausted.

NORTH AMERICAN PROSPECTING & MINING ASSOCIATION. COLORADO.

Office: 405 Temple Court Bldg., Denver, Colo. Mine office: White Pine, Gunnison Co., Colo. Chris C. Sierk, president and general manager; Jas. T. Chase, secretary; Daniel C. Tobin, superintendent. Lands, 60 acres, showing 7 contact veins between limestone and shale giving average assays of 2% copper, 25% lead and 20% zinc, from carbonate and sulphide ores. Has water power and small concentrator, making 55% zinc concentrates and 55% lead concentrates carrying copper and gold.

NORTH ARKANSAS ZINC, LEAD, COPPER, SILVER & GOLD MINING CO. ARIZONA, ARKANSAS & CALIFORNIA.

Office: 380 Wilcox Bldg., Los Angeles, Cal. Idle. J. M. Graybill, president and general manager; M. H. Wells, secretary; J. H. Arbuckle, superintendent. Organized 1902, with capitalization $5,000,000, shares $1 par. Is commonly known as the Five Metals Co. Lands, 25 claims, area 500 acres, in the Spangler district of San Bernardino county, California;

sundry claims near Morristown, Maricopa county, Arizona, and 800 acres of undeveloped zinc lands in Baxter county, northern Arkansas.

NORTH CAROLINA MINE. **NORTH CAROLINA.**

Formerly known as the Fentress and was extensively worked before 1860. Has a 3′ to 4′ vein, dipping at 38° to 60°, opened to depth of 310′.

NORTH FORK COPPER MINING CO. **WYOMING.**

Mine office: Battle, Carbon Co., Wyo. Stuart Edgar, superintendent.

NORTH MOUNT LYELL COPPER CO., LTD. **TASMANIA.**

Absorbed by Mt. Lyell Mining & Railway Co., Ltd.

NORTH PACIFIC MINE. **MONTANA.**

Owned by Daly Mining Co.

NORTH PACIFIC MINING CO. **OREGON.**

Office: 29 Hinckley Blk., Seattle, Wash. Property is the Virginia group, in the Cascade Mountains, eastern Oregon. Has a 30-stamp mill.

NORTH PLATTE COPPER MINING & SMELTING CO. **WYOMING.**

Letter returned unclaimed from Douglas, Wyo.

NORTH POLE MINING CO. **COLORADO.**

Mine office: Crystal, Gunnison Co., Colo. Organized 1902, with capitalization $500,000. Controlled by Porter Nelson and James Stewart, of Aspen, Colo., and Boston parties. A carload of ore smelted assayed 10.8% copper, 4.8% lead and 13.8 oz. silver per ton. Company is developing property in a businesslike manner.

NORTH STAR GOLD & COPPER MINING CO. **NORTH CAROLINA.**

Mine office: Jamestown, Guilford Co., N. C. Jas. Palmer, superintendent. Ores carry gold and copper. Has steam and water power, 20-stamp mill and 50-ton concentrator, employing 35 to 50 men.

NORTH STAR MINING CO. **MICHIGAN.**

Office and mine: 420 East McLeod Ave., Ironwood, Gogebic Co., Mich. Employs 4 men. Peter Lofberg, president; Adolf W. Peterson, secretary. Organized May 1, 1903, under laws of Michigan, with capitalization $25,000, shares $25 par. Lands, 240 acres, held under option, showing several cupriferous amygdaloids, on which a 60′ exploring shaft has been sunk and crosscuts started.

NORTH STAR MINING CO. **WASHINGTON.**

Office: 502 Mutual Life Bldg., Seattle, Wash. Mine office: Index, Snohomish Co., Wash. Employs 12 men. Organized 1900, under laws of Washington, with capitalization $1,000,000, shares $1 par. J. F. Ronald, president; J. S. Chase, secretary; Edw. Ellis, general manager. Lands, 9 claims, area 180 acres, lying between the Ethel and Bunker Hill-Sullivan property, showing a 4′ vein, opened by tunnels of 200′ and 600′, and said to give average values of 10% copper, from bornite and chalcopyrite.

NORTH STAR MINING & MILLING CO. **COLORADO.**

Property sold to Silverton Mining Co.

NORTH STATE MINE. **NORTH CAROLINA.**

An old property near Jamestown, Guilford Co., N. C. Vein runs 2′

to 25′ wide, carrying auriferous sulphide ores. Mine is about 400′ deep and has a 20-stamp mill.

NORTHWEST COPPER CO. **BRITISH COLUMBIA.**

Operated the Van Anda mine for a few months, 1901-1902. Probably dead.

NORTHWEST GOLD & COPPER CO. **OREGON.**

Supposed to have a 60′ copper vein on the Colorado claim, in the Cracker Creek district, near Sumpter, Baker county, Oregon.

NORTHWEST MINING CO. **WASHINGTON.**

Letter returned unclaimed from Kettle Falls, Stevens Co., Wash.

NORTHWEST SMELTING CO. **BRITISH COLUMBIA.**

Office and works: Crofton, Vancouver Island, B. C. Breen & Bellinger, proprietors. Is commonly known as the Crofton smelter. Does a general smelting business and treats most of the ores produced by the Pacific Coast mines of British Columbia.

NORTHWESTERN CONSOLIDATED LUMBER, OIL & COPPER CO. **OREGON.**

Office: care of Glenn M. Deuell, secretary, Grand Rapids, Mich. Dr. O. A. Lacrone, president and general manager, Kalamazoo, Mich. Supposed to have lands in vicinity of Baker City, Oregon.

NORTHWESTERN COPPER MINING CO. **WYOMING.**

Office: 509 New York Life Bldg., Omaha, Neb. Mine office: Encampment, Carbon Co., Wyo. Employs 12 to 15 men. Organized under laws of Wyoming, with capitalization $100,000. Chas. R. Courtney, president; F. E. Brown, secretary. Lands are about one mile west of the Ferris-Haggarty, giving a mile of the strike of an ore body that is apparently a continuation of the Ferris-Haggarty vein, about 20′ in width, with about 6′ of oxide and sulphide ore carrying 30% to 40% copper, with gold and silver values of $6 to $12 per ton. Has about 600′ of underground openings, and plans beginning shipments to the North American smelter in June, 1904. Management is composed of residents of Omaha of good local standing.

NORTHWESTERN SMELTING & REFINING CO. **BRITISH COLUMBIA.**

Offices: 45, Leadenhall St., London, E. C., Eng. Mine office: Crofton, Vancouver Island, B. C. Commonly known as the Crofton smelter. Has a 500-ton smelter, with converter plant, all well arranged and modern, and does an extensive business in smelting copper ores and mattes for various British Columbia mines. Employs about 200 men.

NORTHERN COPPER CO., LTD. **RHODESIA.**

Offices: Salisbury House, London, E. C., Eng. Mine office: Buluwayo, Rhodesia, South Africa. Lord Gifford, V. C., chairman; Bechuana Land Exploration Co., Ltd., managers in South Africa; Thos. D. Davey, resident engineer; Tom Donald, secretary. Registered Feb. 16, 1895, under title of Northern Territories (B. S. A.) Exploring Co., Ltd. Capital, nominal, £250,000; issued, £160,000. Debentures, £100,000 of 6% bonds, issued 1903, redeemable at £105, December, 1908, and convertible, when fully paid, into £10 shares on one month's notice in writing. Lands were originally debt, $2,500,000. F. August Heinze, general manager; Stanley Gifford, secretary and treasurer. Is a subsidiary corporation of the United Copper Co. Mine is developed by 2 shafts of about 1,000 each, timbered with 10x10" square sets, having 12 exits, good ventilation and underground connections with the Parrot, Never Sweat and Little Minah mines. Company is in continuous litigation with subsidiary corporations of the Amalgamated Copper Company.

NISHINOKAWA MINE. **JAPAN.**

Mine office: Oboki-mura, Nii-gori, Iyo, Japan. Ores are chalcopyrite, associated with iron pyrites, hematite, magnetite and sphalerite, in a quartz gangue, averaging 3% to 4% copper and occurring as lenses 3′ to 12′ thick in quartz-schists. Production for 1900 was 183,415 lbs. of refined copper.

NIZINA GOLD & COPPER CO. OF ALASKA. **ALASKA.**

Office: care of S. Thornton Langley & Co., Seattle, Wash. Lands are 25 placer gold claims and 7 copper claims on the Nizina river, a tributary of the Copper river, Alaska. The financial agents advertise that thousands of tons of solid copper have been exposed, and are ready for shipment by means of boats down the rivers, which, of course, is untrue, although the property does carry native copper and may prove valuable, if developed.

NO. 7 MINING CO., LTD. **BRITISH COLUMBIA.**

Mine office: Greenwood, B. C. Capitalization $1,000,000, shares $5 par. Fredk. Keffer, general manager. Lands, sundry well-located claims, partially developed, adjoining the property of the British Columbia Copper Co.

NOBLE MINING & MILLING CO. **MONTANA.**

Mine office: Sheridan, Madison Co., Mont. R. W. Noble, superintendent. Ores carry gold, silver, lead and copper. Has steam power and 10-stamp mill, employing about 20 men.

NOGALES COPPER CO. **ARIZONA & MEXICO.**

Office: 1018 Tribune Bldg., Chicago, Ill. Mine office: Nogales, Santa Cruz Co., Ariz. Employs about 100 men. Organized 1902, under laws of Arizona, with capitalization $3,000,000, shares $5 par. Dr. Arthur E. Thomas, president; Wm. Larsen, vice-president; Dr. Wesley M. Thomas, secretary; Geo. S. Brigham, treasurer; Colby N. Thomas, general manager; Frank N. Cox, superintendent; Geo. B. Ernshaw, consulting engineer. Lands are 27 claims and 10-acre millsite, area 550 acres, in the Patagonia and Pajorita districts of Santa Cruz county, Arizona and the Minas Prietas district of Sonora, Mexico, also the Cerro Prieto gold mines, near Magdalena, Sonora, Mexico, latter bought in 1903. The Peña Blanca copper claims in Arizona show 3 fissure veins averaging 4′ to 5′ wide and 1,200′ to 6,000′ in length, giving average assays of 5% to 8% copper and 2 oz. to 65 oz. siver per ton, from oxide and sulphide ores. The Buena Vista group, in the Patagonia district, has 15 mineral claims, millsite and water-site. The Peña Blanca group, in the Pajorita district, 12 miles west of Nogales, has 6 mineral claims, and the San Bartolo group, in the Minas Prietas district of Sonora has 6 pertenencias. Operations are being concentrated on the Cerro Prieto gold mine at present, this being a large and appearently valuable mine.

NOME-MONTANA-NEW MEXICO MINING CO.

Office: 415 Iron Blk., Milwaukee, Wis. Jas. M. Kerr, president. Claims in advertisements to have gold property at Nome, Alaska, copper claims adjoining the Copper Cliff mine in Montana, and 60 acres of copper lands in the Bromide district of Rio Arriba county, New Mexico.

NONESUCH MINE. **MICHIGAN.**

Office: care of Arthur K. Camp, 78 Prospect Ave., Milwaukee, Wis. A. K. Camp and M. P. O'Brien owners. Is the pioneer and principal mine of the Porcupine Mountain district of Ontonagon county, Michigan. Lands, 640 acres. Total production, 182 tons, 1,072 pounds of refined copper. Mine carries native copper freely in an argillaceous conglomerate-sandstone. Idle for many years. Fully described in Vol. II.

SOCIEDAD FRANCESCA DE MINAS Y FUNDICION DE NONOGASTA. **ARGENTINA.**

Mine office: Nonogasta, Rioja, Argentina. Property includes the Andueza, Santo Toribio and other mines producing gold, silver and copper. Has steam power and small smelter, employing about 200 men.

NORMANBY SYNDICATE. **AUSTRALIA.**

Mine office: Mt. Perry, Tenningering, Queensland, Australia. Lands, 240 acres, freehold. Employs 35 men. Vein is parallel to that of the Mt. Perry mine, with similar geological conditions. Mine is opened to a depth of about 200′. Ore, averaging about, 13% copper and 10 to 15 dwts. gold per ton, is sent to the Aldershot smelter for reduction.

NORMANTON-CLONCURRY RAILWAY & COPPER MINES, LTD. **AUSTRALIA.**

Mine office: Cloncurry, Queensland, Australia.

NORSK-BELGISK MINEKOMPANI. **NORWAY.**

Mine office: Melhus, Flaa sogn, Norway. Is in the Röros district and was working a fahlband, in a small way, at last accounts.

NORTH AMERICAN COPPER CO. **WYOMING.**

Office: 17th & Blake Sts., Denver, Colo. Mine office: Encampment, Carbon Co., Wyo. Employs about 250 men. Organized 1902, under laws of New Jersey, with capitalization $20,000,000, shares $100 par. Controls, through shareholdings, the Encampment Smelting Co., Encampment Tramway Co., Ferris-Haggarty Copper Mining Co., Emerson Electric Light Co., Encampment Pipeline Ditch Co., Encampment Land & Town Lot Co., North American Mercantile Co. and Carbondale Coal Co. John S. Curry, president; Willis Geo. Emerson, vice-president; C. P. Collins, second vice-president; J. H. Fennessy, treasurer; B. H. Leonard, assistant treasurer; E. K. Hum, general manager; Theron H. Tracy, general superintendent.

Lands, 103 acres, including the Ferris-Haggarty mine, showing an outcrop of decomposed and spongy limonite, with carbonate copper stains, as the gossan of a contact vein between a quartzite footwall and mica-schist hanging-wall, vein having an approximately east and west strike and dip of 4°

NORWICH MINE. MICHIGAN.

Undergoing development by Copper Crown Mining Co.

NOTAWAY GOLD & COPPER MINING CO. COLORADO.

Office: Denver, Colo. Mine office: Silverton, San Juan Co., Colo. A. J. Vivian, president and general manager; Wm. Gelder, secretary. Lands, 2 groups of claims, one in Gilpin county, and one in San Juan county. Latter, on Sultan Mountain, is developed by a 400′ tunnel and has electric power and aerial tram. Employs a small force in development work, and is claimed to have $175,000 worth of ore on dumps, awaiting shipment.

NOTAWAY MINING CO. COLORADO.

Mine office: Central City, Gilpin Co., Colo. Jas. I. Perkins, superintendent. Ores carry gold, silver and copper. Has steam power and employs 15 men.

NOVARRA MINE. ITALY.

An old and small mine, in the privince of Piedemont, Italy.

COMPANIA LOS NUEVES. SPAIN.

Mine office: Tijola, Almeria, Spain. Letter returned unclaimed from former general offices, San Andres, 26, Madrid, Spain. Mine idle at last accounts.

NYACK MINING CO. ARIZONA.

Absorbed by Anita Consolidated Copper Co., now Anita Copper Co.

NYMAGEE COPPER MINING SYNDICATE. AUSTRALIA.

Mines sold to Great Cobar Copper Mining Syndicate.

O'OKIEP MINE. CAPE COLONY.

Owned and operated by Cape Copper Co.

OAK HILL MINE. NORTH CAROLINA.

Mine office: High Point, N. C. Said to have a 7′ vein, carrying bornite, covellite, and chalcopyrite, and averaging 18% copper.

OAK HILL MINE. OREGON.

Office and mine: care of Henry Willey, Cooperstown, Tuolumne Co., Cal. Has a 112′ shaft, with a little drifting.

OAXACA MINING, MILLING & INVESTMENT CO. MEXICO.

Office: Wilmington, Del. Mine office: Oaxaca, Oaxaca, Mex. C. Arthur, manager. Property includes the Esperanza and other mines, carrying gold, silver, copper, lead and zinc. Has water power and 10-stamp mill.

OBIE MINE. JAPAN.

Mine office: Nakanosho-mura, Tsu-gori, Bitchu, Japan. T. Sakamoto, owner; K. Ogawa, manager. A very ancient property, showing numerous veins carrying chalcopyrite and small quantities of argentiferous galena with quartz gangue, in 2′ to 4′ veins, traversing clay-slate and granite. Has steam power and a good smelter. Employs about 1,000 men. Production in 1899 was 1,316,745 lbs. of refined copper.

CARRILO OCANA. CHILE.

Office and mines: Taltal, Antofagasta, Chile. Ramon A. Heredia and David B. Contreras superintendents. Mines are La Liga, Estrella de Venus and Gyacolda, carrying ores of gold, copper and silver. Has steam power and 4 Chilean mills, employing 60 to 75 men.

LOS OCOTES GROUP. **MEXICO.**

Office: care of Oest & Zulper, owners, Oaxaca, Mex. Mine office: Ejutla, Jalisco, Mex. Alfred Oest, manager. Ores carry copper, silver and gold. Has a 200′ shaft and 400′ tunnel, employing about 35 men.

OCOTITLAN MINE. **MEXICO.**

Office: care of Harry S. Church, et al, care of International Bank & Trust Co., Guadalajara, Mex. Property is a partially developed mine, two hours horseback ride west of Talpa, Jalisco, Mexico.

OCTAVIA MINING CO. **WYOMING.**

Mine office: Cambria, Wyo. David Jones, president.

ODDIE MINE. **NORTH CAROLINA.**

Owned and operated by Rowan Copper & Gold Mining Co.

OGOYA MINE. **JAPAN.**

Mine office: Nishio-mura, Nomi-gori, Kaga, Japan. T. Yokoyama, owner and general manager. Discovered 1878. Ore is chalcopyrite, associated with tenorite, bornite, azurite, native copper and iron pyrites, with quartz gangue, in numerous veins traversing liparite. Three main veins, practically parallel, are worked, these ranging 1″ to 4′ in width, and 500′ to 2,000′ in length. Management is very progressive, and has recently installed a modern mining and reduction plant. Has water and electric power and 30-ton smelter, employing about 750 men. Production in 1899 was 1,015,759 lbs. refined copper.

OHIO COPPER CO. **UTAH.**

Office: care of H. G. Catrow, president and general manager, Miamisburg, Ohio. Mine office: Bingham Canyon, Salt Lake Co., Utah. Henry Varden, mine superintendent; A. J. Bettles, vice-president. Organized October, 1903, under laws of Utah, with capitalization $1,000,000. Is operated as a close corporation.

Lands, 14 patented claims, area 120 acres, in the Bingham division of the West Mountain district, bought of the Columbia Copper Co. for $225,000. The mine has several shallow shafts, deepest 145′, ore showing an 8″ streak of melaconite running 25% copper, and 30″ of disseminated cuprite averaging 12.5% copper. Also has tunnels of 800′ and 1,150′, with about 1 mile of underground openings. Principal ore body is a vein carrying disseminated chalcopyrite, said to show about 1,000,000 tons. Shipping ore averages 12%, with small gold and silver values, but the amount of shipping ore shown is small compared with the enormous tonnage of low-grade ore, much similar to that of the Utah.

The property has an old 5-stamp mill and 20-ton concentrator, and the company has leased the old Winnamuck mill, below Bingham, and is rebuilding and enlarging it to 150 tons daily capacity. Mine and mill will be served by a spur of the Copper Belt railroad. Production of refined copper in 1902 by this property was 318,885 lbs. and in 1903 monthly output was about 100 tons of concentrates averaging 27% copper. Company plans o begin production early in 1904, at the rate of about 250 tons of ore daily, of which 150 tons will go to the concentrator and 100 tons direct to the smelter. The property is one of more than ordinary promise and has a management that is attending strictly to its own business.

OHIO MINING & MILLING CO. **COLORADO.**

Mine office: Montezuma, Summit Co., Colo. R. T. Williams, superintendent. Ores carry gold, silver and copper. Has steam power and small concentrator, employing about 25 men.

OHIO & ARIZONA COPPER MINING & SMELTING CO. **ARIZONA.**

Corporation dissolved.

OHIO & COLORADO SMELTING & REFINING CO. **COLORADO.**

Office and works: Salida, Chaffee Co., Colo. Timothy Goodwin, general manager; Samuel James, superintendent. Smelter is rated at 1,000 tons daily capacity and is equipped with steam and electric power and refinery, employing several hundred men.

O. K. GOLD & COPPER MINING CO. **ARIZONA.**

Office: Lyndon, Kansas. Mine office: Florence, Pinal Co., Ariz. Employs 3 men. W. L. Newcomer, president; S. B. Johnson, secretary. Organized under laws of Arizona, with capitalization $1,000,000, shares $1 par. Lands, 14 claims, area 280 acres, in the Picacho district, showing numerous veins, of which two, averaging 3′ width, are being developed by 6 shallow shafts, deepest 75′, giving assays up to 20% copper, with traces of gold and silver, from oxide, carbonate and sulphide ores.

O. K. EXTENSION MINING & REDUCTION CO. **UTAH.**

Office: 40 Commercial Blk., Salt Lake City, Utah. Mine office: Blue Acre, Beaver Co., Utah. Employs 3 men. Organized November, 1899, under laws of Utah, with capitalization $150,000, shares 50c. par. A. J. McMullen, president and general manager; C. C. Gott, secretary and treasurer. Lands, 21 claims, area 360 acres, also a 20-acre millsite, near the O. K. mine, in the Beaver Lake district, showing two fissure veins of 5′ average width, giving assays of 4% copper and 6 oz. silver per ton, with traces of gold, from chalcopyrite, opened by 6 shafts, deepest 510′, and a 150′ tunnel, with 1,045′ of underground openings. Has steam power and plans deepening two shafts in 1904.

OKUZU MINE. **JAPAN.**

Mine office: Okuzu-mura, Kita-Akita-gori, Ugo, Japan. Is a silver mine, near Hanawa, making a trivial amount of copper as a by-product.

OLALLA COPPER MINING & SMELTING CO. **BRITISH COLUMBIA**

Office: 206 Temple Court Bldg., New York. Mine office: Olalla, B. C Employs a small force only. W. J. Brewer, president; Nathan Mintz, secr tary and treasurer; W. C. McDougall, general manager. Organized Octobe 1901, under laws of Maine, with capitalization $8,000,000, shares $25 p Also controls the Similkameen & Keremos Ry. Co., capitalized at $3,000,0 Lands, 61 crown-granted claims, also mill and smelter-site of 100 acres, t area about 2,500 acres, in the lower Similkameen and Keremos ca

Osoyoos division of the Yale district, showing contact veins between diorite and felsite, ore bodies occurring in both formations but mainly in the felsite. Veins, about a dozen in number, are said by company to range in width from 3′ to 500′ and are estimated by company to average about 5% copper, 2 to 5 oz. silver and $1 to $40 gold per ton, but this estimate is probably considerably too high. Gangue is spar, garnetite and magnetite. Development includes a 30′ shaft and tunnels of 50′, 250′ and 600′. Property has hand power only and is 87 miles from a railroad, 60 miles of which has steamer transportation. Company plans installation of a smelter in 1904 and estimates that it can mine and smelt the bulk of its ore at a cost not exceeding $2.50 per ton. This can be done, however, only by operating on a very large scale. Ore bodies are decidedly low grade, but are apparently extensive, and the ore is self-fluxing.

OLD BALDY MINE. **ARIZONA.**

Mine office: Tucson, Pima Co., Ariz. W. B. McCleary, superintendent. Ores carry gold and copper. Has steam power.

OLD BALDY GOLD MINING & TUNNEL CO. **NEW MEXICO.**

Mine office: Elizabethtown, Colfax Co., N. M. Thos. C. Sewall, superintendent. Ores carry gold and copper. Has gasoline and electric power.

OLD BOOT MINE. **ARIZONA.**

Sold to Imperial Copper Co. (of Arizona).

OLD CATAWBA MINE. **UTAH.**

Office: care of Judge Theo. Botkin, president and general manager, Salt Lake City, Utah. Property is a group of seven claims, near Milford, Beaver county, Utah, said to give a promising showing of copper.

OLD COLONY COPPER CO. **MICHIGAN.**

Office: 60 State St., Boston, Mass. Mine office: Calumet, Houghton Co., Mich. Employs 12 to 15 men. Organized 1898, under laws of Michigan, with capitalization $2,500,000, shares $25 par, $11 paid in. Annual meeting, second Wednesday in December. H. F. Fay, president; Geo. G. Endicott, secretary and treasurer; James Chynoweth, superintendent; preceding officers, John C. Watson, Wm. Howell Reed, Rogers L. Barstow and Stephen R. Dow, directors. An assessment of $1 was levied in 1903. On September 30, 1903, cash on hand amounted to $33,456.

Official returns to the state of Michigan, as of date Jan. 1, 1903, disclose the following figures.

Amount of cash paid in on capital stock	$300,000.00
Amount paid in by conveyance of property to company	700,000.00
Entire amount invested in real estate	749,000.00
Amount of personal estate	31,441.92

Lands, 1,200 acres, in Sections 17 and 18, T. 56 N., R. 32 W., east of and adjoining the Calumet & Hecla. A complete geological cross-section has been secured by tunnel, driven 1899-1901 from the Eastern Sandstone, 57° west of north, for about 3,000′ at right angles to the formation, which has a strike of No. 33° E., and by diamond drill borings from the Kearsarge amygdaloid eastward to the western end of the tunnel. This work shows pwards of 75 well-defined amygdaloids and conglomerate beds, a numb f which gave a fair showing of copper in the drill cores. There are 5 shaft No. 1 being 400′ deep; No. 2, 250′; No. 3, 550′; No. 4, 100′; and No. 5, 20 Work in 1903 was confined mainly to a lode east of the Kearsarge be from which diamond drill cores showed copper. This was opened by crosscut from the bottom of No. 3 shaft which cut the lode 305′ to the we ward in November, since which time drifting has been in progress. Surfa equipment is small but adequate, and the company has sufficient funds continue explorations for several years.

OLD DOMINION COMPANY. **ARIZO**

Office: 99 John St., New York. Jas. Douglas, president; Chas. Sum Smith, vice-president; Chas. H. Altmiller, secretary and treasurer. Org ized Dec. 22, 1903, under laws of Maine, with capitalization $8,750,0 shares $25 par. Is a securities holding corporation only, formed to prom the operation of the Old Dominion Copper Mining & Smelting Co. and United Globe Mine under a joint management, while technically comply with the injunctions restraining the merging of these two corporati Validity of the powerful merger plan provided by this company has been attacked, but is scarcely open to argument, as each of the subsidiary corporations will retain its identity absolutely unimpaired, although the Old Dominion Co. will control the operations of both subsidiary corporations, through ownership of majority share interests. The United Globe Mine gave 138,000 shares of its stock and $250,000 cash for 138,000 shares of the Old Dominion Co., which has 150,000 shares of its stock for exchange on an even basis for shares of the Old Dominion Copper Mining & Smelting Co., the latter corporation having an issued capital of 150,000 shares. More than 100,000 shares of Old Dominion Copper Mining & Smelting stock, or upwards of two-thirds of the outstanding issue, have been exchanged for shares of the Old Dominion Co.

The plans of the Old Dominion Company, which will control the operations of the Old Dominion Copper Mining & Smelting Co. and the United Globe Mine, provided for the working of both mines as entities, but with free interchange, upon an equable basis, of ores needed for fluxing. The Old Dominion Co. has also financed the pressing floating indebtedness of the Old Dominion Copper Mining & Smelting Co., by means of loans, which are to be repaid from earnings.

The vigorous objections interposed by a small minority interest in the Old Dominion Copper Mining & Smelting Co. to a merger with the Unite Globe Mine are based upon total misapprehension of essential facts in th case. The Old Dominion is apparently a larger and better property th the United Globe, but it lacks sulphide ores, which the United Globe furnish. The Old Dominion has a good smelting plant, which the U Globe lacks, but on the other hand was financially embarassed, whil United Globe, controlled by Phelps, Dodge & Co., has almost unli resources. The Old Dominion mine will also profit by the great te skill, long experience and high financial and general standing of

Dodge & Co. That the arrangement is an equable one will be seen eventually by the few protesting shareholders of the Old Dominion, who will learn in time that it is better to own a half interest in a large and profitable mine than a whole interest in a mine that is large but not profitable, and which they lack the physical and financial resources to render profitable while under their sole ownership.

OLD DOMINION COPPER MINING & SMELTING CO. ARIZONA.

Office: 35 Congress St., Boston, Mass. Mine office: Globe, Gila Co., Ariz. Employs about 300 men. Organized July, 1895, under laws of New Jersey, with capitalization $5,000,000, shares $25 par; issued $3,750,000. Chas. Sumner Smith, president; Chas. H. Altmiller, secretary and treasurer; Dr. L. D. Ricketts, acting manager; Chas. S. Smith, Geo. Napier Towle, Dr. Jos. T. Herrick, Chas. T. Lund, Fred M. Hoar, E. F. Newton and G. Waldo Smith, directors, first three named constituting an executive committee. Annual meeting, first Wednesday in April. Lands, 6 full and 3 fractional claims, at Globe, with a 10-acre millsite adjoining, also the Old Dominion and Keystone claims north of Globe, the Continental group of 240 acres and the Chicago & New York group of 60 acres, latter groups being unconnected with the principal tract. Ores are mainly malachite, with some melanconite and cuprite and a little chrysecolla, all more or less argentiferous and highly silicious, requiring heavy fluxes of iron and lime, also some chalcopyrite and considerable chalcocite, found in narrow but rich veins, the mine showing immense quantities of ore ranging from 5% to 10% in tenor. Deepest opening of the mine is the 12th level, opened in 1902. A new 4-compartment shaft with 75′ gallows frame was down 625′ to the 10th level, at the close of 1903. The mine has been much troubled with a heavy inflow of water, now moderated to 1,000 to 1,500 gallons per minute. To care for this water Prescott pumps of 2,000-gallon and 1,000-gallon capacity per minute are to be installed on the 10th level. Extensive surface improvements were made in 1903, and the mine now has a steel-frame boiler-house and engine-house, a new Nordberg hoist and a complete electric light plant. The mine is served by the Gila Valley, Globe & Northern railway, 125 miles long, connecting with the Southern Pacific at Bowie. Much trouble has been had from excessive freight rates, but these were reduced late in 1902, effecting a saving of upwards of one cent per pound on the mine's production. There is also a railroad line connecting the mine and smelter, this having a 14x20″ Porter locomotive and 50-ton ore cars.

The smelter, remodeled and practically rebuilt in 1903, is of steel frame on stone foundations, with three 250-ton furnaces, making matte, with a converter plant nearly completed. The smelter has a briquetting plant for flue dust and a reverberatory furnace for slags. The smelter plant has 6 boilers and experiments have been made with petroleum for fuel, owing to the great cost of coke and coal.

Production of refined copper in 1902 was 7,992,550 lbs, from 68,840 tons of ore, giving average returns of 5.8% copper. For 1903 the production of refined copper was 8,575,776 lbs. Net cost of copper made in 1902 was

10.81c. per pound. Several small dividends were paid by the original Old Dominion company, but none have been disbursed by the present corporation. The management of the mine was changed in 1902 the present officials afterward bringing suit against A. S. Bigelow and the estate of Leonard Lewisohn for the proceeds of 50,000 shares of stock said to have been illegally converted to the use of the defendants, which suit is still dragging in the courts The management of the company was practically changed again, at the end of 1903, and the property is now in the able hands of Phelps, Dodge & Co. Particulars of this plan are given in the description of the Old Dominion Co.

Costs for 1901 were $5.87 for mining and $4.87 per ton for smelting, and mining costs were $5.70 in 1902 and probably a little lower in 1903. Dr. Ricketts estimates that with some changes mining costs can be put down to $4 per ton and smelting costs can also be reduced materially. The Old Dominion ore bodies are considerably mixed and require careful hand-sorting, both underground and on surface. This, however, has not been the principal trouble in the operations, that being the nature of the ore, which is deficient in sulphur, requiring the use of too much barren flux and causing the loss of much copper in the slags, while charges are frequently frozen in the furnaces, causing frequent delays and heavy losses. The United Globe ores should flux the old Dominion ores to good advantage, and should these prove deficient in any particular, the Phelps-Dodge management can easily supply the exact quality of ore needed from one or more of their numerous mines in Arizona and Mexico. The working arrangement with the United Globe is undoubtedly for the best interests of all shareholders of the Old Dominion Copper Mining & Smelting Co.

OLD HANOVER COPPER CO. **NEW MEXICO.**

Mine office: Hanover, Donna Ana Co., N. M. C. P. Kramer, superintendent. Ores carry copper and silver. Has steam power and employs about 75 men.

OLD HICKORY MINE. **UTAH.**

Owned by Majestic Copper Mining & Smelting Co.

OLD HICKORY COPPER MINING CO. **NEW MEXICO.**

Absorbed by the Copper Chief Mining Co.

OLD NOLL MINE. **AUSTRALIA.**

Mine office: Leighs Creek, South Australia. E. Bernini manager. Has steam power and employs about 25 men.

OLD RELIABLE MINING CO. **NEW MEXICO.**

Mine office: Golden, Santa Fe Co., N. M. J. B. Mayo, superintendent. Ores carry gold and copper. Has two 5′ Huntington mills. Employs 20 men.

OLD TOWN MINING & MILLING CO. **COLORADO.**

Mine office: Russell Gulch, Gilpin Co., Colo. Geo. K. Kimball, Jr., superintendent. Ores carry gold, silver and copper. Has a 900′ shaft, is equipped with steam and electric power and employs about 40 men.

MINAS DE OLLIN, CHANGOA Y ARRIETA. **SPAIN.**

Old properties, carrying ores of copper, silver and lead, in the province of Navarra, Spain. Supposedly owned by an English corporation. Idle.

OLYMPIA MINING CO. OF WYOMING. **WYOMING.**

Office: 187 E. Chicago Ave., Chicago, Ill. Pehr W. Nillson, president; Herman C. Johnson, secretary; John Lundgren, general manager. Lands are supposed to be in the Encampment district of Carbon county, Wyoming.

OLYMPIC MINING CO. **WASHINGTON.**

Office: 301 Lumber Exchange, Seattle, Wash. E. R. Butterworth, president; Alfred Jeffery, secretary. Company advertises stock on the installment plan, claiming that its lands contain gold, copper and coal, but secretary gives as au excuse for not furnishing a statement that the company is not developing a copper mine.

OMODANI MINE. **JAPAN.**

Mine office: Kami-Anana-mura, Ono-gori, Echigo, Japan. Operated by the Mitsu Bishi Gosshi Kwaisha. Opened circa A. D. 1350. Ores are chalcopyrite, bornite, sphalerite and galena, all argentiferous and carrying occasional native silver. Has numerous veins, none exceeding 4′ in width. Production in 1900 was 103,682 momme of silver and 614,438 lbs. of refined copper.

OMAHA COPPER MINING CO.

Office: 1,017 New York Life Bldg., Omaha, Nebraska.

OMAHA GOLD & COPPER MINING & SMELTING CO. **MONTANA.**

Supposed to hold mining claims near Bigtimber, Sweetgrass Co., Mont.

OMAKI MINE. **JAPAN.**

Mine office: Nishitate-mura, Kita-Akita-gori, Ugo, Japan. Opened circa 1750; reopened 1885. Principal value of ore is in argentite, associated with chalcopyrite, galena and sphalerite. Ore bodies are lenses, largest 70′ deep by 130′ long, in tertiary tuff and andesite. Production for 1896 was 858,316 momme silver and 242,690 lbs. refined copper.

OMORI MINE. **JAPAN.**

Mine office: Omori-mura, Nima-gori, Iwami, Japan. Opened circa A. D. 1300; reopened 1525. Was once highly productive, but is apparently nearly worked out. Carries auriferous and argentiferous chalcopyrite in the Eikyu group, and malachite, argentite and native silver in the Hontani group. Production in 1900 was 2,880 momme gold, 121,280 momme silver and 80,139 lbs. refined copper.

ONECO COPPER MINING CO. **MICHIGAN.**

Office: 18 P. O. Sq., Boston, Mass. W. F. Fitzgerald, president; S. S. Millett, secretary and treasurer. Organized 1899, under laws of Michigan, with capitalization $2,500,000, shares $25 par. Lands, 800 acres, near Hancock, Houghton Co., Mich. Tract was originally known as the Hungarian, later as the Fitzgerald. Has had a limited amount of exploratory work, in 1862 and 1899-1900. Has one shaft of about 500′, also 8 dwellings and several small mine buildings. Fully described in Vol. II.

ONEIDA GOLD & COPPER CO. **ARIZONA.**

Letter returned unclaimed from Nogales, Santa Cruz Co., Ariz.

ONTARIO GOLD & COPPER MINING CO. **ARIZONA.**

Office: Prescott, Yavapai Co., Ariz. A. C. Burmeister, manager.

ONTARIO SMELTING CO. **ONTARIO.**

Mine office: Massey Station, Algoma, Ont. Mine shows auriferous chalcopyrite assaying 3.5% to 6% copper.

ONTARIO & COLORADO GOLD & COPPER MINING CO. **ONTARIO & COLORADO.**

Office: 610 Majestic Bldg., Detroit, Mich. Mine office Central City, Gilpin Co., Colo. Dr. J. E. Burgess, president and general manager. Albert H. Roehm, vice-president; Wm. C. Heath treasurer; C. H. Colburn, secretary and assistant general manager. Capitalization $1,250,000, shares $1 par. Has mining claims in Ontario, Yukon and Colorado, former being 65 acres in Cowper Twp., adjoining the Wilcox property, on Spider Lake, in the Parry Sound district. Colorado property is the O'Neill mine, near Central City, carrying ores of copper, silver, gold and lead, with steam power and employing about 20 men.

OPAL GOLD MINING & MILLING CO. **WASHINGTON.**

Mine office: Chesaw, Wash. J. P. Blaine, superintendent. Ores carry gold, silver and copper. Has steam power and employs 10 men.

OPHIR CONSOLIDATED MINES CO. **COLORADO.**

Mine offices: Telluride, San Miguel Co., Colo., and Ames, San Miguel Co., Colo. W. S. Buckley, manager. Ores carry gold, silver, lead and copper, latter secured in small quantities as a by-product. Has electric power, 50-stamp mill and 100-ton cyanide plant, employing about 100 men.

OPHIR COPPER MINING CO. **MONTANA.**

Office: 404-85 Dearborn St., Chicago, Ill. Mine office: Butte, Silver Bow Co., Mont. Organized July 25, 1902, under laws of South Dakota, with capitalization $1,000,000, shares $1 par, in 550,000 temporary preference shares and 450,000 deferred shares; issued, $520,000. Edw. Ryan Woodle, president; Lorene Sheetz, secretary; S. W. Hall, superintendent. Lands, 1 patented claim, in South Butte, showing 3 veins, of 5′, 30′ and 50′ average width, carrying chalcopyrite and bornite returning 1% to 30% copper, 29 oz. silver and $2.20 gold per ton, with molybdenite and occasional lead. Has a 256′ working shaft and two 50′ air shafts, with about 4,500′ of underground openings. Principal values are in silver, but copper will undoubtedly predominate at depth. After shipping about 2,000 tons of ore to the East Helena smelter in 1903, production was suspended, except on the 200′ level, pending deepening of shaft 400′ with a view to developing copper values. Has a 180-h. p. steam plant, with hoist good for 1,000′, a 6-drill Rand air compressor and a 30x40′ carpenter and machine shop. Company estimates that the mine can ship about 350 tons of argentiferous copper ore daily, from the lower levels, when shaft is deepened.

OPHIR GOLD & COPPER MINING CO. **MONTANA.**

Office: Spokane, Wash. Property is in the Blackfoot district, near Helena, Lewis & Clarke County, Montana. M. A. Mitchell, superintendent. Plans to install a small power plant for development work.

OPHIR MINING & DEVELOPING CO. **MONTANA.**

Office: 902 Fisher Bldg., Chicago, Ill. Claims in advertisements to have property in Butte, Silver Bow county, Montana.

OPHIR HILL CONSOLIDATED MINING CO. **UTAH.**

Mine office: Ophir, Tooele Co., Utah. Controlled by Senator W. A. Clark of Montana. E. W. Clark, superintendent. Ores carry gold, silver, lead, copper and zinc. Has water and steam power and 150-ton concentrator, employing about 100 men. Is operated as a close corporation, and no information is given out, but mine is known to be rich and profitable.

OPHIR QUEEN MINING CO. **UTAH.**

Office: Cedar River, Mich. Mine office: Ophir, Tooele Co., Utah. Employs 8 men. Organized Apr. 19, 1902, under laws of Utah, with capitalization $250,000, shares 25 cents par. Wm. S. Laing, president; Saml. Crawford, secretary, treasurer and general manager. Lands, 5 claims, area 60 acres, in the Ophir district, showing a 25′ vein giving assays of 12% copper, 10% lead, 2% to 15% zinc, 16 oz. silver and 40 cents gold per ton, opened by a 310′ shaft with two 5x8′ compartments. Has electric and gasoline power, with a 3-drill Rand air compressor.

OQUIRRH-BINGHAM COPPER CO. **WYOMING & UTAH.**

Office: 1103-279 Dearborn St., Chicago, Ill. Organized under laws of Wyoming, with capitalization $1,000,000. Lands are supposed to be in Wyoming and Utah, mainly the former.

ORDENAURA MINING CO. **MEXICO.**

Mine office: Velardeña, Durango, Mex. E. K. McCann, manager. Ores carry copper, silver and lead.

ORE KNOB MINE. **NORTH CAROLINA.**

Located near New River, Ashe Co., N. C. Was opened before 1860 and closed 1885. Said to have yielded net profits of $60,302 in 1874. Has a fissure vein of 6′ to 20′ width, with nearly vertical dip, carrying mainly sulphide ores nearly free from gangue and claimed to average 12% to 20% copper. Vein crosses a formation of micaceous gneiss and mica-schist. Has 11 shafts, deepest 400′, and a 150-ton smelter, built in 1902.

OREGON COPPER CO.

Incorporated February, 1903, by J. F. Culter, of Spokane, Wash., et al.

OREGON GOLD & COPPER CO. **OREGON.**

Incorporated August 1902, by Anthony Mohr, et al, of Sumpter, Ore.

OREGON SHORT LINE MINING CO. **NEVADA.**

Mine office: Pioche, Lincoln Co., Nev. E. F. Freudenthal, superintendent. Ores carry copper, silver and lead.

OREGON SMELTING & REFINING CO. **OREGON.**

Office and works: Sumpter, Baker Co., Ore. Edw. W. Mueller, general manager; Carr B. Neel, superintendent. Is building a 150-ton smelter, to be operated by steam and electric power. Copper matte will be made, chiefly as a carrier for gold and silver from the mines of districts adjacent.

ORFORD COPPER CO. **NEW JERSEY.**

Office: 43 Exchange Pl., New York. Works office: Constable Hook,

N. J. Is controlled by the International Nickel Co. and refines nickel ma and ores from New Caledonia and nickel-copper matte from Canada, in dition to treating copper ores and mattes from the United States, Cana Mexico and elsewhere. Capacity of plant is about 6,000,000 lbs. of cop and 1,000,000 lbs. of metallic nickel monthly. Works are exception well equipped and this company has a deservedly high reputation for me lurgical ability and the high grade of its manufactured products.

ORIENT GOLD MINING CO. **WASHINGTON.**

Mine office. Bossburg, Stevens Co., Wash. John Brown, superintendent at last accounts. Ores carry gold and copper. Has steam power.

ORIENTAL MINING & MILLING CO. **ARIZONA.**

Office. Jamestown, N. Y. Mine office: Providence, Yavapai Co., Ari A. F. Kent, president; W. A. Keeler, secretary; W. A. Kent, assistant treasurer; L. B. Kent, superintendent. Is primarily a gold and silver mine, carrying a small percentage of copper. Has steam power and a 20-stamp mill.

ORIENTE DE THARSIS GROUP. **SPAIN.**

Mine office: care of Wm. Guthrie Bowie, manager, Alosno, Huelva, Spain. Property is large group of government concessions, including the Huera, showing extensive outcrops, remains of ancient works and some old scoria. Has about 400 metres of underground development, on a 5% ore body of 12½ metres, a 4% ore body of 7 metres and a 3.5% ore body of 5 metres, and a body of cupriferous pyrites has been cut to the northward. Deepest crosscut, about 90 metres below the crest of the hill, is on a level with the Tharsis railway, and ore can be shoveled into the railroad wagons.

ORIGINAL MINE. **MONTANA.**

Office and mine: Butte, Silver Bow Co., Mont. Owned by Senator W. A. Clark. Is a small but rich property securing a considerable annual production of ore, which is smelted at the Butte Refining Works. Main shaft is 1,600′ deep and shows a wider and richer vein at depth than above, ore being mainly chalcocite. Has a 36x72″ duplex first-motion Nordberg hoist, with 126′ steel gallows frame, the highest in the camp, and is to install a large Ingersoll-Sergeant air compressor early in 1904.

ORIOLE COPPER MINING CO. **WYOMING.**

Office and mine: Douglas, Converse Co., Wyo. Hon. C. D. Clark, president and general manager; E. J. Wells, secretary and treasurer. Lands, 4 claims and a millsite, with a 155′ main shaft bottomed in a 40″ vein of carbonate ore giving assays of 30% to 40% copper.

ORION MINING CO. **NEW MEXIC**

Office: El Paso, Texes. Mine office. Lordsburg, Grant Co., N. M. B. Randall, superintendent. Ores carry copper, gold and silver. Has st and gasoline power.

SOCIEDAD MINERA EL ORITO. **CH**

Mine office: El Orito, San Felix Vallenar, Chile. Operates Las mines, opened 1888, and also owns the Carmen mine, 190′ deep, oper

1857, now idle. Production, shipped as matte, is equivalent to about 1,500,000 lbs. refined copper yearly.

ORO COBRA MINING CO. **ARIZONA.**

Office: Burlington, Iowa. Letter returned unclaimed from former mine office, Prescott, Arizona. S. M. Wilkinson, secretary and treasurer; T. C. Archer, general manager. Organized October, 1901, under laws of Arizona, with capitalization $1,500,000, shares $1 par. Lands, 17 claims, area 340 acres, also 40-acre millsite, in the Ellsworth and Copper Basin districts, showing numerous cupriferous veins.

ORO DENORO MINES, LTD. **BRITISH COLUMBIA.**

Office: care of J. S. C. Fraser, Rossland, B. C. Mine office: Anaconda. B. C. Smith Curtis, secretary-treasurer and managing director. Lands adjoin the British Columbia, showing 3 wide veins, the upper portions exposed, carrying massive magnetite with copper sulphides and gold values, changing at an average depth of 25′ to disseminated chalcopyrite. Main vein is about 120′ wide, carrying ores ranging $4 to $12 per ton in value. Property began shipping 150 tons daily in 1903, ore going to the Montreal & Boston smelter and being reduced at an average charge of only 16c. per ton, as it has an excess of iron, needed for fluxing other ores, for which a bonus is allowed. Management is regarded as capable and property gives promise of making a large and valuable low-grade mine.

ORO GRANDE MINES CO. **ARIZONA.**

Letter returned unclaimed from former office, 1034 Park Row Bldg., New York. Mine office: Wickenburg, Maricopa Co., Ariz. Has upwards of 3,500′ of underground openings, showing a large ore body considerably mixed with country rock. Property is regarded as promising, but management is entirely too much given to promising.

FRANCISCO RODRIGUEZ OROZCO. **MEXICO.**

Office and mine: Mazapil, Zacatecas, Mexico.

ORTONA MINE. **AUSTRALIA.**

Office: care of A. Linedale, owner, Irvinebank, Queensland, Australia. Mine office: Percyville, Queensland, Australia. Has limited development only.

ORVILLE GOLD & COPPER MINE CO. **BRITISH COLUMBIA.**

Mine office: Golden, B. C. Supposed to be idle.

OSAKA ELECTROLYTIC REFINING CO. **JAPAN.**

Office and works: Osaka, Japan.

OSCEOLA CONSOLIDATED MINING CO. **MICHIGAN.**

Office: 199 Washington St., Boston, Mass. Mine office: Opechee, Houghton Co., Mich. Organized 1873 and reincorporated 1903, under laws of Michigan, with capitalization $2,500,000, shares $25 par. Has paid dividends of $4,247,300 to close of 1903, and has declared a dividend of $1, payable January, 1904. Annual meeting, second Thursday in March. Albert S. Bigelow, president; W. J. Ladd, secretary and treasurer; preceding officers, J. Henry Brooks, Edw. P. Grew, Norman W. Haire and Edward R. Hall, directors; Wm. E. Parnall, superintendent; Wm. J. Uren, assistant superintendent; A. Lincoln Burgan, mill superintendent.

Official returns to the state of Michigan, as of date Jan. 1, 1903, disclose the following figures:

Amount cash paid in on capital stock	$ 890,286.78
Amount paid in by conveyance of property to company	1,609,371.22
Entire amount invested in real estate	1,301,221.47
Amount of personal estate	813,064.33
Amount of unsecured or floating debt (including advances on copper since paid)	1,039,090.15
Amount due corporation (including personal estate)	277,081.17
Production of copper, 1902	13,416,396 lbs.

Mining lands, 2,120 acres, in 4 separate tracts, also sundry miscellaneous lands and a millsite. Company is sued by the heirs of the late Abner Sherman, who claim to own an undivided three-fourths interest in the southwest ¼ of section 5, T. 56 N., R. 32 W., same being 160 acres of the North Kearsarge mine. Basis of this claim is the erroneous filing of a deed in Ontonagon county instead of in Houghton county, in 1863, deed having gone down with Mr. Sherman when he was drowned by the sinking of the steamer Sunbeam, in 1863.

The mines of the Osceola Consolidated are the Osceola proper, North Kearsarge, South Kearsarge and Tamarack Junior. Mining was first done in 1873, on the southern extension of the Calumet conglomerate, 6 shallow shafts being sunk thereon, but this bed proving unremunerative, except under a few acres, was abandoned and work begun on the Osceola amygdaloid, a bed lying parallel with and 730′ east of the Calumet conglomerate. The Osceola mine proper, area 720 acres, lying next south of the Calumet & Hecla, has 6 shafts on the Osceola bed, which has a strike of approximately N. 39° E., shafts being numbered from north to south. Shafts 1 and 2 are permanently abandoned. No. 3, with 3 compartments and about 3,000′ deep, and No. 4, 600′ next south, with 3 compartments and about 3,700′ deep, are idle, with small likelihood of reopening until copper sells at 15c. per pound or better. No. 5, 1,300′ south of No. 3, is 3,900′ deep. This shaft suffered from a crush for nearly its entire depth, and was cut down and retimbered throughout, work being completed in February, 1903. No. 6, or Opechee shaft, 1,300′ next south, 4,000′ deep, shows some excellent stopes, especially in the southern drifts. Shafts 5 and 6 have practically duplicate surface equipments, with Nordberg hoists good for 6,500′ depth. About 60% of the production of the old Osceola is secured from No. 6, and 25 power drills are worked in the two shafts. Crosscuts have been sent to the Calumet conglomerate at various depths, without encouragement. The mine has a complete power equipment, with shops, mostly of stone, and a large number of dwellings for workmen. Water is pumped from Lake Superior for use of the mine and employes. The Tamarack Junior, area 120 acres, lying between the Centennial and Calumet & Hecla mines, has 2 vertical shafts on the Calumet conglomerate and was closed down late in 1902, having been unprofitable for several years before work was suspended. The only work under way is an exploratory minze, sinking on the plane of the lode from the 12th, or bottom level, of No. 2 shaft, at a depth of 3,360′, which will soon reach the boundary line, at a depth of 400′ below the 12th level.

The North Kearsarge, area 1,120 acres, lies north of the Wolverine, with which it has underground connections, and with which land has been traded to the extent of 13½ acres, to permit each mine to square its boundaries with the strike of the lode. Shafts are numbered from south to north. The work of cutting No. 1 down to 3-compartment size and retimbering was completed in June, 1903. This shaft has a Nordberg hoist good for depth of 6,500′, operating two 6-ton skips in counterbalance. No. 2 shaft, out of commission, is 2,400′ deep. No. 3 is 2,280′ in depth, opening an enormous area of rich ground of exceptionally uniform value, the north drifts being particularly encouraging, while the Ahmeek developments point to rich ground for the North Kearsarge to its northern boundary line. The southern drifts from No. 1 toward the Wolverine are also in excellent ground. The North Kearsarge employs 40 power drills. All old shafts and drifts have been straightened, at the close of 1903. The Kearsarge amygdaloid ranges 16′ to 20′ in width in this mine, and while bunchy, shows some of the best stopes ever opened in the Lake district. With present development and equipment the productive capacity of the mine is 2,000 to 2,500 tons daily. At No. 1 shaft there is a stone compressor house, completed in 1903, housing a 30-drill compressor. The office building, combination machine and carpenter shop and warehouse, all of wood, are at this shaft. At No. 3 is located a 45-drill compressor, with two-stage air end and compound steam end, having 22x48″ and 42x48″ steam cylinders and 40x48″ and 36x48″ water-jacketed air cylinders and vertical intercooler, housed in a 25x55′ stone and brick building with steel truss roof.

The South Kearsarge, area 160 acres, lies south of the Wolverine and east of the Centennial. Development was begun September, 1899, and the best stopes are toward the Centennial line, the lode showing about the same width and characteristics as in the North Kearsarge and Wolverine mines. The South Kearsarge is opened by 2 shafts, ample for all future requirements, these being 1,100′ apart. No. 1, the northern shaft, is 1,020′ deep and can be sunk about 3,000′ before reaching the boundary line. Two skips are operated in counterbalance, and the shafthouse is exceptionally large and well-equipped, as it also cares for the rock from No. 2 shaft, with which it is connected by a 1,100′ trestle. No. 2 shaft is 1,000′ deep and can be sunk about 1,800′ before reaching the boundary line. This shaft has a single skip, but is soon to have a second. The surface equipment of the South Kearsarge is mainly second-hand, but efficient and ample for all present requirements. The mine has air compressors of 40-drill capacity, to be increased by 15, and works about 40 drills. The productive capacity of the South Kearsarge is about 1,000 tons daily.

The Osceola has three stamp mills, on the shore of Torch Lake, adjoining those of the Tamarack. The old wooden mill, built 1886 and now idle, has four heads of an average daily capacity of perhaps 300 tons each. The second mill is 135x215′, completed 1899, with three stamps having 20″ pistons with 24″ stroke, supplied with circular shoes and striking 100 blows per minute at 95 lbs. steam pressure. These heads have stamped above 550 tons each, on test runs. The screens are circular, with ⅜″ openings, allowing easy discharge of coarse copper. The third mill, completed 1902, stands in line with the other two, and is of steel, 176x213′, with 4 Nordberg heads of the 4-valve type, having 20x24″ cylinders and circular mortars with ⅝″ screens and hydraulic separators. About 20% of the copper secured in milling comes from the separators and the mortar discharges.

There are 110 Hodge jigs, with quick eccentric return motion, also 6 round tables and one Wilfley table for each stamp, the latter taking headings from the round tables, also an Allis-Chalmers Chilean mill for regrinding. The Osceola's newest mill is one of the best in the Lake Superior district and its stamps have crushed as high as 570 tons per day each. One head is to be compounded, as an experiment, the cylinders to be superimposed as a steeple tandem compound.

The 43x150′ steel boiler-house, adjoining the mills and furnishing power for all three, has three 250-h. p. 72″ boilers of 150-lb. pressure and nine 84″ 250-h. p. boilers of 105-lb. pressure, all of the locomotive firebox type. Coal is brought over a trestle in railroad cars, to a 500-ton bin. An automatic ash discharge flushes water from a stand-pipe at intervals of 3 minutes. Draft is furnished by a 150′ brick-lined self-supporting steel stack. An Allis-Chalmers Corliss engine runs a Morgan-Gardner direct-current 220-volt generator of 100-kw. capacity, operating incandescent and enclosed arc lamps.

The joint pumphouse of the Osceola and Tamarack mines is 35x70′, of steel, housing a 40,000,000-gallon triple-expansion Nordberg pump having 22″, 40″ and 60″ cylinders, with three 30″ horizontal plungers of 52″ stroke and 42″ discharge. Water is secured through an 8′ tunnel running 1,275′ under Torch Lake and drawing water through 3″ intake holes, these guarding against clogging by ice. Rock is hauled from mine to mill by the Hancock & Calumet railroad.

Production for 1902 was 13,416,396 lbs. and for 1904 should reach or possibly exceed 20,000,000 lbs. of refined copper. Average returns of copper in 1903 were about 18 lbs. per ton stamped, but should exceed 20 lbs. in 1904. The mills are crushing 3,500 to 3,750 tons daily, with 7 heads working full time. Mining and stamping costs aggregated $1.37 per ton in 1903 and were probably lower in 1903, and should show a further reduction in 1904. In the death of the former superintendent, Capt. W. E. Parnall, Sr., early in 1903, the Osceola lost an exceptionally able manager, Mr. Parnall being one of the leading mining men of the United States and a man of exceptional skill and executive force. While Amalgamated interests are affiliated to some extent with the Osceola management, neither the Amalgamated nor individuals conducting its affairs own Osceola stock to any extent worth mentioning. The company ended 1903 in very fair financial position, showing a vast improvement over the two preceding years. The future of the company rests with the Kearsarge mines, which are exceptionally fine properties and should enable the Osceola to earn handsome profits in 1904.

OSCEOLA GOLD & COPPER MINING CO. **WYOMING.**

Property sold to North American Copper Co.

OSCEOLA JUNIOR MINING CO. **WYOMING.**

Office: Rawlins, Wyo. J. M. Rumsey, secretary. Supposed to have lands in vicinity of Rudefeha, Carbon county, Wyoming.

OSCURO COPPER CO.

Office: care of H. A. Rideout, Wollaston, Mass. Organized March, 1903, with capitalization $250,000.

OSE MINE. **JAPAN.**

Mine office: Ose-mura, Kita-gori, Iyo, Japan. Ore is chalcopyrite, averaging 3% to 4% copper, occurring in lenses, the largest of which is 230′ long, 100′ wide and 43′ deep. Production in 1900 was only 9,426 lbs. of refined copper.

LOS OSOS MINE. **CALIFORNIA.**

Office: care of J. M. Gleaves estate, owner, San Francisco, Cal. Property, at San Luis Obispo, San Luis Obispo county, California, was worked circa 1865. Ore occurs in a porphyritic fissure vein traversing sandstone and shales.

OTAVI MINEN-UND EISENBAHN-GESELLSCHAFT. **GERMAN SOUTHWEST AFRICA.**

Offices: Unter den Linden, Berlin, Germany. Mine office: Tsumeb, German Southwest Africa. Organized 1903, under laws of Germany, with capitalization 20,000,000 marks, in 20 series of 10,000 shares each, par value 100 marks. A. Schoeller, chairman; Dr. P. D. Fischer, vice-chairman; A. Gaedertz, general manager; F. Muller, and Dr. P. Gloner, assistant general managers; Th. Gathmann, mine superintendent; Tob. Toennesen, engineer in charge of railway. Lands, 500 square miles, freehold, including the Otavi and Tsumeb copper mines. Latter has been largely developed and can begin production upon a considerable scale when given rail facilities and a smelter. A railroad line of 570 kilometres is now being built from Alexandre, Portuguese Southwest Africa, to the mines, by the firm of Arthur Koppel, at an approximate price of $4,500,000. The Otavi is a property of more than ordinary importance, and as it is financed and managed by strong and successful men of affairs, is apt to be heard from as a considerable producer eventually, though several years may be required to complete the railroad and smelting plant and put the mine on a good productive basis.

OTAVI MINES & RAILWAY CO.

See Otavi Minen & Eisenbahn Gesellschaft.

OTTUMWA COPPER CO. **WYOMING.**

Office: Laramie, Wyo. Mine office: Holmes, Albany Co., Wyo. C. B. Richey, president; W. B. Russey, secretary and treasurer. Lands are the Ottumwa group of claims, about 6 miles southeast of the Rambler mine.

Property is being developed with considerable vigor, and company seems conservatively managed.

COMPANIA MINERA LAS OURAS. **MEXICO.**

Mine office: Tepezalá, Aguascalientes, Mex. Gabriel Chaves, superintendent. Has copper and silver ores. Uses animal power and employs about 40 men.

OURAY CHIEF MINING CO. **COLORADO.**

Mine office: Ouray, Ouray Co., Colo. D. Woods, manager. Ores carry gold, silver and copper. Has steam power and 100-ton smelter, employing 30 to 40 men.

SUCESION RAMON F. OVALLE. **CHILE.**

Mine office: Carrizal Alto, Freirina, Atacama, Chile. Operates the Canto del Agua mine, opened 1870, also the Santa Margarita mine, 700′ deep, and about a dozen smaller properties. Annual production, about 600 tons of refined copper, shipped as matte.

OVERFLOW MINES. (NO LIABILITY.) **AUSTRALIA.**

Offices: 18 Bridge St., Sydney, N. S. W., Australia. Mine office: Bobadah, N. S. W., Australia. T. H. Palmer, manager. Ores carry gold, silver, lead and copper. Has a Ball mill, 40-ton cyanide plant and 50-ton smelter. Employs about 150 men.

OVERLAND GOLD MINING CO. **OREGON.**

Mine office: Cableville, Ore. M. E. Bain, manager. Ores carry gold, silver, copper, lead and zinc.

OVOCA COPPER SYNDICATE, LTD. **IRELAND.**

Offices: Norfolk House, Laurence Pountney Hill, London E. C., Eng. Mine office: Ovoca, County Wicklow, Ireland. Registered Nov. 27, 1901, with capital, nominal, £12,000; issued £9,057. St. John Winne, secretary. Property is the old Cronnebane mines, in the Vale of Ovoca, which were making about 1,250,000 lbs. of refined copper annually at the close of the Eighteenth Century. Mines were closed, circa 1875, and are to be reopened on the advice of Mr. Philip Argall. Ore is mainly chalcopyrite, associated with quartz gangue, averaging a scant 3% copper, 1.5% zinc, 1.5 oz. silver and 1 dwt. 6 gr. gold per ton. High grade oxide and carbonate ores were mined out in past operations, but the vein, about 50′ in average width, shows immense bodies of low-grade disseminated sulphides. Experiments are being conducted with the Neill leaching process.

JOHN OWEN MINING & MILLING CO. **COLORADO.**

Mine office: Idaho Springs, Clear Creek Co., Colo. Geo. Riley, superintendent. Ores carry gold, silver, lead and copper. Has steam power and employs about 25 men.

OWOSSO GOLD & COPPER MINING CO. **WASHINGTON.**

Company moribund, and practically dead.

OXFJORDALEN COPPER CO., LTD. **NORWAY.**

Offices: 23, Leadenhall St., London, E. C., Eng. W. A. Stearns, secretary. Capital, nominal, £10,000.

OXIDE COPPER CO. **ARIZONA.**

Office: 85 Ames Bldg., Boston, Mass. Mine office: Red Rock, Pinal

Co., Ariz. T. K. Plancuel, superintendent. Lands are the Copper Prince group, of 30 claims, in the Silver Bell district. Has steam power. Stock issue controlled by Arimex Consolidated Copper Co.

PACIFIC CONSOLIDATED MINING CO. NEVADA.

Office: 131-32 Broadway, New York. Mine office: Reno, Washoe Co., Nev. Organized under laws of South Dakota, with capitalization $3,000,000, shares $1 par, in $200,000 preferred and $2,800,000 common stock. Chas. B. Hill, president; Wm. Hazen Peck, secretary; R. W. Parry, superintendent; Dr. Jos. Hyde Pratt, consulting engineer. Lands, 18 claims, in the Pyramid district, developed by shafts and tunnels, with about 6,000′ of underground openings, oxidized zone extending to depth of 200′ to 350′. Gives good gold and silver values, gold values growing small at the water level, but silver values remaining good in the sulphide zone. Ore is chalcopyrite, associated with iron pyrites, in a silicious gangue. Property has been favorably reported upon by Dr. Pratt, who enjoys high standing as a competent and conservative mining engineer.

PACIFIC CONSOLIDATED MINING & SMELTING CO. UTAH.

Office: care of W. F. Snyder, president, Salt Lake City, Utah. C. O. Ellingwood, secretary and treasurer. Organized October, 1902, with capitalization $1,500,000, shares $5 par, to develop the Amy and Baltimore groups of 29 claims, in the Merrimac district of Utah.

PACIFIC COPPER CO. ALASKA.

Reorganized as Pacific Coast Mining, Milling & Development Co.

PACIFIC COPPER CO. MICHIGAN.

Office and lands: Houghton, Houghton Co., Mich. Organized August, 1890, under laws of Michigan. Lands, 960 acres, northwest of the Atlantic mine, carrying the Atlantic ashbed. Had cash assets of about $25,000 at last accounts.

PACIFIC MINING & METALS CO. ARIZONA.

Office: 213 Kittredge Bldg., Denver, Colo. Mine office: Tucson, Pima Co., Ariz. Employs 16 men. John Russell, president; F. A. Hunt, secretary; John D. Coplen, treasurer and general manager. Organized January 7, 1903, under laws of Arizona, with capitalization $10,000,000, shares $1 par. Lands 30 claims, in two groups, with miscellaneous holdings giving total area of 760 acres. The north group is in the Globe district of Gila county, and the south group in the Canon del Oro district of Pinal county, former group showing country rocks of schists and porphyry, and south group granite-porphyry country rock. South group is said to average 5% copper from carbonate, oxide and sulphide ores. The north group has 3,309′ of underground openings, and the south group 550′, claimed by company to show 2,000,000 tons of ore.

PACIFIC SMELTING CO., LTD. CHILE.

Offices: St. George's House Eastcheap, London, E. C., Eng. Works office: Taltal, Atacama, Chile. Registered July, 29, 1902, to take over the property of the Smelting Corporation, Ltd., with capital, nominal, £100,000;

issued, £25,107. Major Francis I. Ricarde-Seaver, F. R. S., chairman; G. M. Barber, general manager; Geo. Mountier, secretary.

PACIFIC COAST MINING, MILLING & DEVELOPING CO. ALASKA.

A reorganization of the Pacific Coast Copper Co. Has a lease of promising copper claims on Prince of Wales Island, Alaska, but suffers from financial debility.

PACIFIC COAST ORE SAMPLING WORKS. CALIFORNIA.

Office and works: Oakland, Alameda Co., Cal. J. Bruce Gibson, general manager. Has a 250-ton plant equipped with electric power.

PACIFIC COAST SMELTING & REFINING WORKS. CALIFORNIA.

Office and works: Bay Point, Contra Costa Co., Cal. Is owned by the Copper King, Ltd., of unfortunate memory. Supposed to be under lease to George and Robert Mitchell. Has a 100-ton furnace, with steam and electric power.

PAGOEAT COPPER CO. CELEBES.

Said to be developing chalcocite and chalcopyrite ore bodies 4′ to 5′ wide and averaging 10% copper, Island of Celebes, Dutch East Indies.

PALACE GOLD & COPPER CO. ARIZONA.

Office: 1104 D. S. Morgan Bldg., Buffalo, N. Y. Geo. A. Sanborn, president; W. E. Waterman, assistant secretary. Capitalization, $3,000,000, shares $1 par. Claims to own 38 claims in Maricopa and Yavapai counties, Ariz. Company apparently organized to sell stock, as it cannot be learned that any mining development is in progress.

PALM DEVELOPMENT CO. CALIFORNIA.

Office: care of E. M. Ross, Los Angeles, Cal. Lands are 23 miles northeast of Acton, Los Angeles Co., Cal., showing auriferous and argentiferous malachite, occurring as replacements in a porphyritic dike averaging 180′ wide and traceable 1½ miles. Has three shafts, deepest 125′. Had a leaching plant, but water supply gave out. Idle.

PAN AMERICAN EXPLORATION CO. MEXICO.

Office: 711 Missouri Trust Bldg., St. Louis, Mo. Mine office: Manzanillo, Coahuila, Mex. Schuyler S. Gates, general manager. Ores carry gold, silver and copper. Owns the Cacoma mines and smelter, closed down by reason of poor management. Has a 200′ shaft and 850′ tunnel, with water power. Also owns the Camotlan mine, 10 hours ride by horseback from Manzanillo. Property is regarded as valuable, but only a small portion of the funds raised have been expended on actual development.

PAN AMERICAN MINES CO. MEXICO.

Mine office: Etzatlan, Jalisco, Mex. James M. Parker, superintendent. Is developing the Santa Laura mine, carrying copper, gold and silver, and employs about 20 men.

PAN-AMERICAN MINING & SMELTING CO. ARIZONA.

Office: 11 Broadway, New York. Mine office: Prescott, Yavapai Co., Ariz. Organized under laws of Arizona, with capitalization $15,000,000, shares $5 par, in $3,000,000 of 7% preferred and $12,000,000 of common stock. F. Howard Skinner, president; H. F. Lindsley, secretary and treasurer.

Company succeeded the Lone Pine Mining Co., of unfortunate memory, and is supposed to also have holdings in the neighborhood of Maguarichic, Chihauhua, Mexico, through control of the stock of the United Metals Mining & Smelting Co.

PANTEIDAL COPPER CO., LTD. **WALES.**

Offices: 20-21, Lawrence Lane, London, E. C., Eng. G. Thompson, secretary. Capital, nominal, £25,000. Has mining rights over two farms in Merionethshire, Wales.

PANUCO COPPER CO., LTD. **MEXICO.**

Mine office: Panuco, Monclova Coahuila, Mex. Chas. May, manager. Has extensive mines at Panuco and Romero Rubio, State of Coahuila. The Panuco mines are largely opened and well equipped, with steam power and small smelter. Company was organized in 1898, and has seen much trouble, owing to rascalities of sundry insiders, and corporation is to be wound up. Production in 1902 was 665 tons refined copper.

PANULCILLO COPPER CO. **CHILE.**

Succeeded by Central Chile Copper Co., Ltd.

PAPAGO MINING CO. **ARIZONA.**

Letter returned unclaimed from former office, Aztec, Yuma Co., Ariz.

PAPOVSKI MINE. **SIBERIA.**

Office and mine: Semipalatinsk, Siberia. Owned and operated by Papov's Successors. Production in 1899 was 129,497 lbs. of refined copper.

PAR VALUE GOLD MINING CO. **COLORADO.**

Mine office: Turret, Chaffee Co., Colo. Floyd Withrow, superintendent. Property is the Gold Bug mine, carrying gold and copper ores. Has steam power and employs 12 or 15 men.

PARADOX COPPER-GOLD MINING GO. **COLORADO.**

Absorbed by San Juan Smelting & Refining Co.

PARAMATTA COPPER MINES, LTD. **AUSTRALIA.**

Offices: 22 Chancery Lane, London, W. C., Eng., and Brookman's Bldgs., Adelaide, So. Australia. Mine office: Wallaroo, Daly County, So. Australia. E. Dervaux, chairman; H. & W. Bickford, advisory board in Australia; Leigh G. Hancock, mine manager; H. Duquesne, secretary in London; H. L. Todd, secretary in Adelaide. Registered May 18, 1899, with capital, nominal, £200,000; issued, £180,000. Lands, 630 acres, held on a 99-year lease, on a guaranty of 1s. per acre annually, plus royalty of 2.5% on net profits. Company has also bought the old Yelta mine recently.

This is an old and important Australian mine, reopened in 1900 by present company, management of which has recently been changed. Vein ranges up to 8′ in width and in richest portions assays 25% copper. Has perhaps 50,000 tons of ore developed. Has a good mining equipment of modern machinery, including a 150-ton concentrator, and is building a smelter which should go into blast early in 1904. Company figures on producing at rate of 250 tons fine copper monthly, by close of 1904. Smelter will eventually have a converter plant. This property, being vigorously managed, bids fair to become one of the most important of Australian copper producers within the next two or three years. Production first 5 months of 1903 was 263 long tons of copper, netting a profit of about £4,000.

PARINGA COPPER MINES, LTD. **AUSTRALIA.**

Letter returned unclaimed from former office: 34, St. Mary's Axe, London. Mine office: Callington Adelaide, South Australia. W. Davis, mine manager. Capitalization £200,000. Lands, 172 acres, 36 miles from Adelaide.

PARK GOLD & COPPER MINING CO. **IDAHO.**

Mine office: Mullan, Shoshone Co., Idaho. Patrick Burke, superintendent, at last accounts. Has a 1,000′ tunnel, opening a 20′ vein said to assay 8% to 30% copper.

PARK CITY MAJESTIC MINING CO. **UTAH.**

Letter returned unclaimed from former office and mine, Park City, Summit Co., Utah. Lands, 12 claims, with 3 parallel veins 8′ to 20′ wide with 4 pay-streaks, largest 9″, showing auriferous copper carbonates and galena, opened by a 200′ tunnel, giving assays of 13% copper, 30 oz. silver and $18 gold per ton.

PARROT SILVER & COPPER CO. **MONTANA.**

Office: Washington & Church Sts., Boston, Mass. Mine office: Butte, Silver Bow Co., Mont. Employs about 400 men. Chas. H. Dickey, president; Chas. D. Burrage, secretary; Harry A. Galway, superintendent. Organized 1880, under laws of Montana, with capitalization $2,300,000, shares $10 par; issued, $2,298,500. Is supposed to have a treasury surplus of upwards of $1,000,000 and was formerly a considerable dividend payer, having disbursed profits of $6 in 1900 and $4.50 in 1901. Last dividend paid was 50c., in January, 1902.

The following table gives a summary of operations and results for the fiscal year ending June 30, 1903:

Tons of ore extracted	253,284.00
Gross yield per ton	$ 8.91
Total cost of mining	710,831.22
Cost of mining per ton	2.81
Total cost of transportation	45,591.12
Cost of transportation per ton	.18
Total cost of reduction	692,266.74
Cost of reduction per ton	2.73
Paid for labor	771,701.87
for machinery and supplies	631,396.0
and seaboard expenses	220,814.0
	$2,255,869
	710,831

Lands, 19 claims, well located, in the central portion of the Butte district, this being one of the pioneer mines of the camp. A barren zone occurs at a depth of about 1,000′ but good ore bodies are found below. The ore averages about 3% copper and carries fair silver and gold values. Properties operated are the Parrot, Bellona and Little Minah. The Little Minah has a 1,000′ two-compartment shaft and is connected underground with the Nipper. The main shaft of the Parrot, about 1,700′ deep, has three compartments to the 4th level and 4 compartments below, being connected underground with the Colusa-Parrot, Never Sweat, Nipper and Original mines. This shaft has a steel gallows-frame, 112′ high and weighing 125 tons, with a maximum load capacity of 50 tons. The Parrot shaft has a 2,500-h. p. hoist, with 28x96″ cylinders, capable of raising 10-ton loads from a depth of 3,000′, hoisting two double-deck cages with 10-ton skips swung under, using a flat steel rope ⅝″ thick and 8″ wide. Machinery plant includes an 80-drill Ingersoll-Sergeant air compressor and a 22-drill Rand compressor. Mine buildings are mainly of steel, stone and brick, these including a new engine house, boiler house, compressor house and various shops. The mine has an antiquated smelter, idle since 1900, ores being reduced at the Washoe plant of the Anaconda. Company also owns and operates copper refining works at Bridgeport, Conn.

Production of refined copper for the year ending June 1, 1903, was about 15,000,000 lbs. and for the year 1903 was probably about 14,000,000 lbs. The ore is running lower in grade than formerly, as is almost invariably the case with old mines and as is proving the case with the Butte mines as a whole. The property is entangled with the Heinze interests in numerous lawsuits and is so badly involved in litigation that shareholders were enjoined from holding any annual meeting or transacting any business whatever, in 1903.

PARRY SOUND COPPER MINING CO., LTD. **ONTARIO.**

Office: 604 Germania Life Insurance Bldg., St. Paul, Minn. Mine office: Parry Sound, Ont. Robert Forbes, agent. Lands, about 14,000 acres, including the McGown and Wilcox mines, on the eastern shore of Georgian Bay. Ores are chalcopyrite and bornite. Has a 10-stamp mill.

PASS CITY COPPER CO.

Office: care of H. E. Runkle, El Paso, Texas.

PATHFINDER CONSOLIDATED MINES, LTD. **BRITISH COLUMBIA.**

Mine office: Grand Forks, B. C. John Rogers, superintendent. Ores carry gold, silver and copper. Has steam power.

PAUDORNE COPPER MINING CO. **VIRGINIA.**

Company refused to accept a letter addressed to Houston, Virginia. Organized December, 1902, under laws of South Dakota, to do a general mining business in Virginia.

PAYMASTER MINE. **UTAH**

Mine office: St. George, Washington Co., Utah.

COMPANIA MINERA LA PAZ. **MEXICO.**

Mine office: Cuatro Cienegas, Coahuila, Mex. Ores carry silver and copper. Employs about 75 men.

PEACH BOTTOM COPPER CO. NORTH CAROLINA.

Letter returned unclaimed from Elk Creek, Ashe Co., N. C.

PEACOCK COPPER CO. CALIFORNIA.

Office: 114 Liberty St., New York. Mining office: Bagdad, San Bernardino Co., Cal. Robert Dixon, president; C. B. F. Palmer, secretary; Newton Evans, general manager; C. F. Schrader, superintendent. Organized under laws of West Virginia, with capitalization $1,500,000, shares $5 par. Lands, 200 acres, are in the Lavic district, showing sundry copper ores, mainly chapcopyrite of concentrating grade, occuring in old lava flows, assaying 8% to 10% copper, 8 oz, silver and $2 to $5 gold per ton. Has steam power, with 50-ton concentrator 8 miles from the mine, employing about 25 men.

PEAK MINE. AUSTRALIA.

An idle property at Peak Downs, Clermont, Central Queensland, Australia, from which very rich ore was obtained at the opening of the mine. Property paid £278,250 profits to shareholders, after trucking ore about 300 miles. An attempt to reopen the mine, circa 1898, was frustrated by a decline in copper and the death of the manager. Property is freehold and exempt from labor conditions. Mr. W. Lees states that a considerable tonnage of ore is in sight, and that the property is worthy of investigation.

PEARL AND LILLIE MINE. COLORADO.

Mine office: Newett, Chaffee Co., Colo. F. H. Denman, superintendent.

PEHOVAZ HERMANOS Y CA. PERU.

Mine office: Uliachin, Cerro de Pasco, Peru. Firm operates a mine that is a small producer of silver and copper.

PELLON COPPER KING MINES. ARIZONA.

Sundry claims in vicinity of Tucson, Pima county, Arizona.

PENA COPPER MINES. SPAIN.

Offices: Suffolk House, 3, Laurence Pountney Hill, Cannon St., London, E. C., Eng. Mine office: Nerva, Huelva, Spain. Registered September, 1900, with capital, nominal, £450,000; issued, £400,000; debentures, £200,000 at 5%. Carl Heinrich Von Siemens, chairman; Nicol Brown, deputy-chairman; T. Stevenson Dick, secretary; T. D. Lawther, mine manager. Lands, about 750 acres, 2 miles northeast of the Rio Tinto, being the Peña de Hierro group of 17 old mines, taken over from the Sociedad Peninsular de Brussels.

Property was estimated, in 1900, to show 1,734,474 long tons of ore, averaging better than 1.6% copper and 46% sulphur. In 1902 the company removed 155,060 cubic metres of overburden. Ores are divided into cupreous pyrites, iron pyrites and washed sulphur ore, considerable old ore being leached for copper and later sold as washed ore. The lixiviation plant has settling tanks, boiler and pump. A 2½ mile private railroad, costing £13,000 with terminals and other improvements, gives rail connections. Improvements at the mines include a number of dwellings.

Production of fine copper from cementation was 413 long tons in 1901 and 624 long tons in 1902, and probably exceeded 750 long tons in 190 The ore mined in 1902 averaged 1.36% copper and 47.24% sulphur, an at the close of the year the mine had 14,801 tons of export ore ready for shipment, with 351,574 long tons of ore in leach heaps, which was added to materially in 1903. Ore production in 1902 was 195,916 long tons, of which 5,907 long tons were mined underground, the balance being won open-cast. The ore mined in 1902 actually carried about 2,700 long tons of copper, but as the bulk went to the teleras, production was but a fraction of this amount. For proper extraction of values the leach heaps require some years of weathering, as explained in the description of the neighboring Rio Tinto mine. The Peña became a profitable undertaking in 1903, and despite many heavy expenditures in the way of permanent betterments, which were charged direct to operating expenses, promises substantial earnings for the future. The mines are undoubtedly very valuable and despite the grumbling of certain shareholders, the management seems to be handling the property for the best interests of its owners.

SOCIEDAD ANONYMA MINERA DO PENAFLOR. SPAIN.

Office: Bilbao, Vizcaya, Spain. Mine office, Penaflor, Sevilla, Spain. Mineral property includes the Concepcion, Descuido and Preciosa mines.

PEND D'OREILLE GOLD & COPPER MINING CO. WASHINGTON.

Mine office: Davenport, Lincoln Co., Wash. J. B. Tuttle, superintendent.

PENISULAR MINING & SMELTING CO. MEXICO.

Office: 301 Bradbury Bldg., Los Angeles, Cal. Mine office: San Quintin, Baja California, Mex. Employs about 100 men. Organized 1902, under laws of Arizona, with capitalization $5,000,000, shares $1 par. Maj. Geo. H. Sisson, president; Colin Timmons, general manager; Geo. P. Brown, manager; C. R. Dagget, superintendent. Lands, 48 groups of claims, approximately 200 miles south of San Diego, California, northwest of the Boleo, on the opposite or west coast of Lower California. The various claims are 4 to 15 miles from tidewater, with roads to the land-locked harbor of San Quintin, the best haven between San Diego and Acapulco. In addition to mining lands the company has a 50-acre millsite and 6,000 lots in the town of San Quintin.

The various groups of claims show a considerable variety of ores, and 6 groups have mines more or less extensively developed. Principal operations are at the Julio Caesar and Santa Maria, the latter having a 20′ vein opened by a 100′ shaft, with a second vein, the Alexandria, ranging 6′ to 12′ in width. Sundry fissure and contact veins of 6′ to 40′ width, with gossan cappings, on the company's various properties are claimed to be developed sufficiently to show upwards of 250,000 tons of ore averaging 10% copper, 15 oz. to 60 oz. silver and $8 gold per ton. The ores seem to be of sufficient variety to afford a free smelting mixture.

A 150-ton furnace is now building, in Los Angeles, for the proposed smelter, and the company figures that ore can be trammed to the coast and lightered to the smelter at a cost of not exceeding $2 per ton. Other estimates of costs are $1 per ton for mining and $2 per ton for smelting, total $5, which figure will probably be considerably exceeded in actual practice. The Peninsular railway has a station at the smelter site. The company also plans erecting and operating coke ovens, estimating that coke can be produced at a cost of $6 per ton. The somewhat ambitious plans of the company also include the maintenance of a steambarge line, waterworks telegraph and telephone systems, electric lights and a general store. The company has some good people among its directorate and shareholders and is said to have expended upwards of $200,000 in development.

SOCIEDAD PENINSULAR DE BRUSSELS. SPAIN.

Property sold to Peña Copper Mines, Ltd.

PENN MINE. MICHIGAN.

Office: care of J. H. Rice, Houghton, Mich. Lands, 1,440 acres, in Ontonagon county, Michigan. Fully described in Vol. II.

PENN MINING CO. CALIFORNIA.

Mine office: Campo Seco, Calaveras Co., Cal. Albert C. Harmon, manager. Operates the old Campo Seco, Hecla and Satellite mines, which were considerable producers circa 1860-1870. Ores are slightly argentiferous and auriferous chalcopyrite, associated with sphalerite and iron pyrites, with gangue ranging from talcose schist through clay to quartz. Has 5 tunnels and 2 shafts, deepest about 500′. Has steam and gasoline power and 100-ton water-jacket furnace, employing pyritic smelting. Matte is brought up to 60% in tenor, in three heats. Cement copper is also produced by leaching old waste-burrows.

WILLIAM PENN MINING CO. WYOMING.

Office: Lewisburg, Pa. Mine office: Encampment, Carbon Co., Wyo. Idle. J. E. Hedding, president; J. W. Van Valzale, secretary and treasurer; S. E. Phelps, manager. Organized 1903, under laws of Wyoming, with capitalization $1,000,000, shares $1 par; $350,000 unissued. Lands, 3 claims, area 60 acres, in the Upper Platte district, showing a 4′ vein carrying carbonate ores and chalcopyrite, opened by a 75′ shaft. Company plans resuming work in spring of 1904, to deepen the shaft and install machinery.

PENNSYLVANIA MINE. WASHINGTON.

Letter returned unclaimed from Egypt, Lincoln Co., Wash.

PENNSYLVANIA COPPER CO. NEW MEXICO.

Office: Lyndhurst Blk., Shamokin, Pa. Mine office: San Pedro, Santa Fe Co., N. M. Thos. A. Lister, Albuquerque, N. M., president and general manager; M. F. Nagle, secretary and treasurer; Chas. W. Myers, superintendent. Lands, 9 claims, area 180 acres, in Bernalillo county, New Mexico. Has 8 fissure veins, of which one is developed by a 230′ shaft with a little drifting, ore from which has given smelter returns of 21% copper and 13 oz. silver per ton.

PENNSYLVANIA COPPER MINING CO. PENNSYLVANIA.

Office: 1221 Arch St., Philadelphia, Pa. Mine office: Pittstown, Montgomery Co., Pa. Organized December, 1902, under laws of Delaware, with capitalization $200,000, shares $1 par. John M. Anck, president; Paul Morris, secretary and treasurer. Lands, 20 acres, carrying veins producing ore giving assays of 5% to 10% copper.

PENNSYLVANIA MINING CO. NEW MEXICO.

Office: Franklin, Pa. Mine office: Los Cerillos, Santa Fe Co., N. M.

Wm. A. Brown, superintendent. Ores carry gold, silver, copper and lead. Has gasoline power and employs 10 to 12 men.

PENNSYLVANIA CENTRAL GOLD MINING CO. **COLORADO.**

Mine office: Russel Gulch, Gilpin Co., Colo. J. J. Riley, superintendent. Property is the Delaware Chief mine, carrying ores of gold, silver and copper. Has steam power and employs about 15 men.

PERCY-CHESTER CONSOLIDATED MINING CO. **COLORADO.**

Office: Council Bluffs, Iowa. Mine office: Red Cliff, Eagle Co., Colo. F. M. Donald, lessee; B. A. Hart, superintendent. Ores carry gold, silver and copper. Has steam power and employs 25 men.

CRESCENCIO PEREZ. **MEXICO.**

Office and mine: Mineral de Asientos, Aguascalientes, Mexico.

FRANCISCO DE P. PEREZ. **CHILE.**

Operates the Central mine, opened 1880 in the department of Santiago, Chile. Annual production, shipped as matte, is equal to 250 to 300 tons of refined copper.

PERKIOMEN LEAD & COPPER MINES. **PENNSYLVANIA.**

At Shannonville, Montgomery Co., Pa. Once extensively worked and produced a large variety of copper and lead ores. Idle for some years.

PERSON CONSOLIDATED COPPER & GOLD MINES CO. **NORTH CAROLINA.**

Mine office: Virgilina, Halifax Co., Va., Property is 1,372 acres in several neighboring tracts, located in Person county, North Carolina. Organized under laws of New York, with capitalization $1,000,000, shares $10 par. E. D. Beecher, president and general manager. Main shaft, 330′. Has good steam power equipment and 50-ton concentrator, shipping concentrates averaging 45% copper and 20 oz. silver per ton, with small gold values. Also ships a limited amount of high-grade ore averaging 30% copper and 10 oz. silver per ton, sent direct to smelter. Employs about 100 men and secures an annual production of about 1,000,000 pounds of copper.

DR. CARL PETERS ESTATES & EXPLORATION CO., LTD. **RHODESIA.**

Offices: 96–98, Leadenhall St., London, E. C., Eng. Dr. Carl Peters, managing director; F. A. Matthei, secretary. Registered July 11, 1898, with capital, nominal, £150,000; issued, £101,000. Has right to locate 1,500 claims of 500 acres each on lands of the Chartered company, Mozambique company and Zambesia company, and has so located 100 copper claims and 305 gold claims.

PEWABIC MINING CO. **MICHIGAN.**

Former mine is now owned by the Quincy Mining Co. Final dividend of $5,423.43, in liquidation, was paid, December, 1903.

PEYTON CHEMICAL CO. **CALIFORNIA.**

Office: San Francisco, Cal. Mine office: El Dorado, El Dorado Co., Cal. Employs about 30 men. Property is the Noonday mine and adjoining claims, in the Diamond Springs district, the Noonday being held under bond and lease. Has shipped ore to the company's works at Peyton, Contra Costa county, California.

PHI DELTA THETA COPPER MINING CO. WYOMING.

Letter returned unclaimed from former office and mine, Dillon, Carbon county, Wyoming.

PHILADELPHIA COPPER & GOLD MINING, MILLING & SMELTING CO. MEXICO.

Office: 317 Drexel Bldg., Philadelphia, Pa. Mine office: San Martin Hidalgo, Jalisco, Mex. Employs about 100 men. Organized 1900, under laws of New Jersey. Capitalization $300,000, shares $1 par. Edwin F. Hall, president; Francis J. Fee, secretary; Josiah G. Williams, treasurer; Augustine F. Paul, general manager; Michael J. Slattery, purchasing agent; Ernest Koch, mill superintendent; Braulio Medina, mining captain. Lands, 57 pertenencias, area 141 acres, also a 2-acre millsite, in the Ameca district, including the Ajax, La Perla, La Concha, San Vicente and other mines, showing 14 fissure veins, of which 2 carrying sulphide ores are being developed on the Ajax, these averaging 12′ width with estimated average values of 7% copper, 2 oz. silver and $20 gold per ton. Has 8 shafts averaging 100″ in depth, also 6 shallow shafts, with total of about 3,000 of underground openings. Has good steam power equipment, 40-ton Ellspass mill, 25-ton lixiviation plant and 30-ton concentrator.

PHILADELPHIA & ARIZONA MINING CO. ARIZONA.

Office: 614 Real Estate & Trust Bldg., Philadelphia, Pa. Mine office: Chloride, Mohave Co., Ariz. Employs about 75 men. Organized 1900, under laws of Arizona, with capitalization $1,000,000, shares $1 par. H. T. Goodman, president; E. F. Lukins, secretary and treasurer; E. T. Loy, general manager; W. F. Miller, superintendent; F. R. Brooks, mill superintendent. Lands, in the Wallapai district, include the Minnesota, Merrimac, Connor, Manzanita and other mines, carrying sulphide ores in fissure veins averaging 6′ width with assay values of 1% to 20% copper, 15 oz. silver and $6 gold per ton, with a little lead. Development is scattered over a number of different mines, including 20 shafts from 20′ to 600′ in depth, and a 3,500′ tunnel. Has steam and electric power, 10-stamp mill, 150-ton concentrator and other necessary equipment. Property is well managed and valuable.

PHOENIX MINE. AUSTRALIA.

Mine office: Cobar, Robinson Co., N. S. W., Australia. Was in process of exploration at last accounts.

PHOENIX CONSOLIDATED COPPER CO. MICHIGAN.

Office: 11-13 William St., New York. Mine office: Phoenix, Keewenaw Co., Mich. Employs about 250 men. Organized April, 1899, under laws of Michigan, with capitalization $2,500,000, shares $25 par, $11 paid in. Last assessment $1, May, 1903. John R. Stanton, president; Wm. C. Stuart, vice-president; J. Wheeler Hardley, secretary and treasurer; Frank McM. Stanton, agent; preceding officers and J. Oppenheim, directors; Wm. A. Dunn, superintendent; Edw. Hall, mining captain; Con. Bedell, mill superintendent; Jas. Hagen, clerk; American Loan & Trust Co., of Boston, transfer agent; Old

Colony Trust Co., of Boston, registrar. Annual meeting, second Monday in March.

Official returns to the state of Michigan, as of date Jan. 1, 1903, disclose the following figures:

Amount cash paid in on capital stock	$944,812.00
Amount paid in by conveyance of property to company	500,000.00
Entire amount invested in real estate	505,000.00
Amount of personal estate	71,360.08
Amount of unsecured or floating debt	58,366.38

The Phoenix Consolidated lineally succeeds the Lake Superior Copper Co., which was the first regularly organized corporation to engage in copper mining in the Lake Superior district. The history of the Phoenix under previous managements is given at length in Vol. II.

Lands, 2,505 acres, being Sections 19 and 20, west half of each of Sections 17, 20 and 29, and fractional Section 18, all in T. 58 N., R. 31 W., including the old Phoenix proper, the St. Clair and Garden City mines and 80 acres of the Atlas tract. Lake Superior lies on the north, the Meadow, Humboldt and Eagle river properties on the east, Atlas and Union on the south and the Cliff mine of the Tamarack on the west. Five different fissure veins have been opened on the consolidated property, these being known as the Phoenix, East Phoenix, Armstrong, Ward and Robbins, or West Vein. The Phoenix proper, not worked now, was opened, 1844, on the Phoenix fissure, and closed 1886, securing a total output of 7,773 tons, 39 lbs of refined copper, this including the largest mass of native copper ever found, weighing upwards of 500 tons. From 1873 to 1877 the mine made money and paid one $20,000 dividend. For the 14 years 1872-1885 the yield of refined copper was 473 lbs. per fathom stoped, or approximately 27 lbs. per ton. The Phoenix vein averages 3′ to 6′ wide, with nearly vertical dip and strike of N. 5° W., with two practically vertical shafts, the Tyler, 300′ deep and the Crocker, 780′ deep, also an incline from the Tyler shafthouse following the dip of the stratified beds, with depth equivalent to 1,000′ vertically, this shaft nearly paralleling the "false slide" that underlies the greenstone.

Some 20 cupriferous fissures, mostly narrow and of small promise, have been opened on the lands of the present company since 1844. The Ashbed lode was also opened by a 400′ adit, the bed proving 5′ to 25′ wide, very bunchy and not especially promising. The Allouez conglomerate, found under the greenstone both east and west of the Phoenix, is missing here, as are sundry other amygdaloid and conglomerate strata noted on either side. The Garden City mine was operated 1859 to 1868 and the St. Clair was worked 1865 to 1874 and 1880 to 1885, these mines having a joint productive record of 543 tons, 468 lbs, of refined copper.

The St. Clair fissure averages 18″ to 24″ width, with a dip of 84°, and a strike of N. 15° W. The mine is very dry, not making enough water for the boilers on surface. The shaft is 8x12′ inside of timbers, with one skipway and a compartment for pipes and ladders. The mine was opened awkwardly by a nearly vertical 400′ shaft, from the bottom of which a drift ran 700′

north to the "false slide" on which a winze or blind shaft was sunk at an angle of 45°, and from which drifts were opened north on each level to the "true slide" underlying the greenstone at an angle of 27°. This has been remedied by holing the blind shaft through to surface by an upraise. The completed incline shaft, entirely superseding the old shaft, leaves surface at an angle of 32° and on the fourth level, at the depth of 725′, changes to 42°, running to the eleventh level, a total depth of 1,710′. A drift-crosscut, the opening being a drift on the fissure vein and a crosscut on the formation, was driven 2,090′ south from the greenstone, on the fourth level, of the St. Clair shaft, giving a complete cross-section of the rock strata and showing sundry mineralized beds, of which the most promising was a 40′ amygdaloid cut some 60′ south of the old vertical shaft. The skip in this shaft does not reach surface, being connected by a gravity tram over a 300′ trestle and though a short tunnel with the temporary rockhouse. A permanent rockhouse duplicating that of the West vein is under consideration.

The West vein, formerly known as the Robbins, is 3′ to 6′ wide with nearly vertical dip and strike of N. 16° E., corresponding in dip and strike with neither fissures or stratified beds. The old vertical shaft was cut down, retimbered and sunk to depth of 855′, with an almost uniformly good showing in the new levels. Drifts on the fissure to north and south have cut numerous amygdaloid beds, these yielding good mass and stamp copper at their intersections with the fissure. An amygdaloid bed, opened on the eighth level by a south drift, gave a 7-ton mass late in 1903. This shaft has about one mile of stoping ground opened and is equipped with a good surface plant, including a remodeled hoist, boilers, Ingersoll-Sergeant air compressor and a new rockhouse with 18x24″ crushers. Owing to the narrow veins, baby drills are employed, these using ¾″ steel and weighing but 100 lbs. without lugs, permitting their easy handling in four-foot stopes and obviating the breaking of considerable wall-rock, which would be unavoidable in the use of power drills of ordinary size.

The shops, built 1902, are under one roof, and have the following dimensions: machine shop, 30x60′; power house, 24x42′; carpenter shop, 30x60′. There is also a substantial office, store, warehouse, barns and a number of new and remodeled dwellings, the mine location being an exceptionally handsome one. The company has a private telephone exchange, connecting all departments of the mine and mill. Water for mine and domestic uses is taken from a 3,000,000-gallon dam, 12′ deep with area of 300x700′, built across the Eagle river. A large stationary Worthington pump in the railroad roundhouse connects with the dam and has 900′ of hose for fire protection. Mine and mill are connected by a 3½ mile narrow-gauge railroad, equipped with one locomotive, rock-cars and flat-cars.

The stamp mill, 50x190′, of wood on concrete foundations, is located on Eagle river, about 2½ miles north of the mine. The mill has an 18x24″ stamp, with 24 Hodge jigs, 4 Wilfley tables and 8 Overstrom tables, departing from accepted types in having no finisher jigs and no slime tables, the Wilfleys taking the fines and the Overstroms caring for the slimes. The mill has a daily capacity of about 300 tons and was put in commission Oct. 1, 1903, working day shifts only and crushing about 150 tons daily, but will probably run double shift, beginning with the spring of 1904. Wash water is supplied by a wooden dam, 90′ wide and 10′ high, with a 12x24″ launder leading to the mill, this having a fall of 13′ in a distance of 3,000′.

Production of the Phoenix in 1903, for something less than three months of milling, with a single head working single shaft, was 202,823 lbs. of refined copper and should exceed 1,000,000 lbs. in 1904. The veins are narrow, but rich, and apparently will give an average of about 0.6% in heavy copper alone. Production is at the rate of about 34 to 37 lbs. of mineral per ton, and a minimum estimate of the mines' probable percentage would be about 1.5% mineral. The copper is exceptionally pure, Phoenix wirebars having an electrical conductivity of 101.2. The mine gives every promise of proving what it has been expected to become, that is, a rich and profitable small mine.

PIC COPPER & GOLD MINING CO. OF LAKE SUPERIOR, LTD. **ONTARIO.**

Neither office nor lands of company can be located. Property was advertised as "directly north of the Calumet & Hecla," but advertisements neglected to state how many score miles north.

PICACHO-BLANCO MINING CO. **ARIZONA.**

Mine office: Morristown, Maricopa Co., Ariz. Is a consolidation of the San Domingo Gold & Copper Co. and Exposition Mining Co., with capitalization $5,000,000, shares $1 par. M. E. Waldstein, president; T. O. Otis, secretary and treasurer. Lands, 31 claims, in Yavapai and Maricopa counties, Arizona. Has a 400′ main shaft, with free-milling old ores said to average $22 per ton. Has gasoline power, 15-stamp mill and 25-ton cyanide plant.

MINAS PICACHO Y CAMPO RICO. **MEXICO.**

Mine office: Bavispe, Sonora, Mex. B. J. Hone, manager. Ores carry copper, gold, silver and lead. Has water power, arrastras and small adobe smelter.

FELIX R. PICASSO. **PERU.**

Office and mine: Cabeza Negra, Ica, Peru.

PIEDMONT COPPER MINING & SMELTING CO. **VIRGINIA.**

Office: 320 Broadway, New York. Mine office: Elkton, Rockingham, Co., Va. Idle. Organized 1901, under laws of New Jersey, with capitalization $2,000,000, shares $100 par, $30 paid in. Maurice D. Brown, president; Jas. G. Blauvelt, vice-president; E. Porter Emerson, secretary and treasurer; S. D. Brown, general manager. Property shows 3 fissure veins carrying occasional native copper and sulphide ores, giving estimated average values of 6% copper, 10 oz. silver and $15 gold per ton. Veins said to be persistent and traceable for about a mile, with geological conditions much the same as at the High Top mine, adjoining. Company plans to erect a smelter eventually.

PIEDRA Y CA. **CHILE.**

Office and mine: Caldera, Atacama, Chile. Mine has steam power and employs about 100 men.

COMPANIA MINERA PIEDRAS VERDES Y ANEXAS. **MEXICO.**

Office: Fuerte, Sinaloa, Mex. Made small shipments of matte averaging 40% copper, 20% lead and 200 oz. silver per ton, in 1902.

COMPANIA MINERA PIEDRAS VERDES Y ANEXAS. **MEXICO.**

Mine office: Alamos, Sonora, Mex. Angel Almado, president; Joaquin A. Mange, superintendent. Has copper ores developed by a 350′ shaft and 375′ tunnel. Has steam power and employs about 75 men.

PIERCE MINING CO. **COLORADO.**

Mine office: Central City, Gilpin Co., Colo. Stephen Hoskin, manager. Ores carry gold, silver and copper. Has steam power and employs 10 men.

NEGOCIACION MINERA DE PILARES DE TERAS. **MEXICO.**

Mine office: Pilares de Teras, Sonora, Mex. Alberto C. Garcia, superintendent. Is primarily a silver mine, carrying small values in copper, gold and lead. Main shaft, 700′; tunnel, 1,400′. Has steam power and employs about 200 men.

PILOT KNOB COPPER MINING CO. **NEVADA.**

Neither office nor mine located. Claimed to be in Nevada.

LES MINES DE CUIVRE PILOU, LTD. **NEW CALEDONIA.**

Entire stock issue held by Caledonia Copper Co., Ltd.

PINAL COPPER CO. **ARIZONA.**

Office: 1103 Fullerton Bldg., St. Louis, Mo. Mine office: Globe, Gila Co., Ariz. Organized under laws of Arizona, with capitalization $2,000,000, shares $10 par. Jos. F. Langler, president; A. L. Steinmeyer, secretary; Chas. A. Lemp, treasurer; G. P. Andrews, manager; Leslie C. Mott, superintendent. Lands, 160 acres, 8 miles northwest of Globe, known as the Black Copper group, developed by 10 shafts and tunnels and claimed to have 20,000 tons of 10% to 15% ore in sight. Last work was in 1901, when small ore shipments were made to El Paso smelters.

PINE HILL CONSOLIDATED MINING CO. **CALIFORNIA.**

Office: 1316-141 Broadway, New York. Mine office: Wolf, Nevada Co., Cal. J. Frank Mase, secretary and treasurer; Cerf Rosenthal, superintendent. Has a copper ledge 100′ wide, carrying azurite, malachite, bornite, chrysocolla and native copper, with a gold vein on the footwall and auriferous gossan capping, opened by a two-compartment main shaft. Company also has a gold mine, quite extensively developed.

PINKHAM MINE. **ARIZONA.**

Letter returned unclaimed from Chloride, Mohave Co., Ariz.

RODOLPHO PINOCHET. **CHILE.**

Office and mine: Lo Espejo, Santiago de Chile. Operates the Vieja copper mine, equipped with steam power and employing 150 to 200 men.

PINTO COPPER CO. **NEW MEXICO.**

Office: 9 Bartles Bldg., Iola, Kan. Mine office: Santa Rica, Grant Co., N. M. Organized July, 1902, under laws of South Dakota, with capitalization $2,500,000, shares $1 par. Employs 8 to 16 men. Geo. A. Bowlus, president; F. S. Bennett, secretary and general manager; Samuel Allen, superintendent. Lands, 8 claims, area 121 acres, in the Central district, showing 4 veins carrying carbonate and sulphide ores said to average 20′ width and to carry 2.5% to 12% copper, 3 oz. to 10 oz. silver and $2 to $400 gold per ton. Has shafts of 65′, 70′, 75′, and 140′, with a little drifting.

PINTO CREEK COPPER CO. **ARIZONA.**

Name changed to Arizona & Hancock Mining Co.

PINTO CREEK MINING & SMELTING CO. **ARIZONA.**

Office: 7 Tootle-Lemon Bldg., St. Joseph, Mo. Mine office: Globe, Gila Co., Ariz. Organized 1896, under laws of Arizona, with capitalization $1,000,000, shares $1 par. Thos. G. Cockrill, president; Grant S. Watkins, secretary; J. W. Castle, treasurer and manager. Lands, 10 claims, area 200 acres, in the Globe district, showing 3 fissure veins of 3′ to 4′ width carrying sulphide ores giving assays of 6% copper, 4 oz. silver and $2 gold per ton. Main development is on the Yo Tambien claim, which has a 400′ shaft showing a promising body of sulphide ore, with a 70′ shaft on the Manitou claim and 3 tunnels of 1,500′ aggregate length, giving upwards of 3,000′ of underground openings. Has gasoline power, 10-stamp mill, 25-ton concentrator and an aerial tramway connecting mine and mill. Regarded as a promising property.

PIT RIVER GOLD, SILVER & COPPER MINING CO. **CALIFORNIA.**

Mine office: Redding, Shasta Co., Cal.

PITKARANTA KOPPARBRUK. **FINLAND.**

Mine office: Pitkaranta, Veburg, Finland. Ore is chalcopyrite with sahlite gangue, traversing granite. An ancient property and a small but steady producer. Production for 1897 was 344 long tons refined copper.

PITTSBURG MINE. **COLORADO.**

Mine office: Central City, Gilpin Co., Colo. Peter McFarland, superintendent. Ores carry gold, silver and copper. Has steam power and employs 10 to 15 men.

PITTSBURG COPPER MINING & REDUCTION CO. **ARIZONA.**

Office: 300 Heist Bldg., Kansas City, Mo. A swindle, promoted by Theodore Stegner, a notorious promoter of fake mining schemes. Company holds 40 acres of alleged copper mining ground in Box Canyon, on the Bill Williams Fork river, about 50 miles from Congress Junction, Arizona, and also claims to own other lands, none of which can be located. Company is capitalized at the preposterous sum of $150,000,000, and the shares are worth something less than the paper on which they are printed.

PITTSBURG MINING & MILLING CO. **IDAHO.**

Formerly operating at White Bird, Idaho Co., Idaho. Probably dead.

PITTSBURG & ARIZONA MINING CO. **ARIZONA.**

Was operating, September, 1903, near Charleston, Cochise Co., Arizona.

PITTSBURG & CHIRICAHUA DEVELOPMENT CO. **ARIZONA.**

Has 16 claims, 22 miles south of San Simon, Cochise Co., Arizona.

PITTSBURG & DULUTH DEVELOPMENT CO. **ARIZONA.**

Office: Calumet, Mich. Mine office: Bisbee, Cochise Co., Ariz. Employs about 20 men. Organized 1903, under laws of Arizona, with capitalization $750,000, shares $15 par, $10 paid in. Chas. Briggs, president; John S.

Dymock, vice-president; Peter Ruppe, treasurer; Gordon R. Campbell, secretary; preceding officers, Thos. F. Cole, Chester A. Congdon, Jas. Hoatson, Thos. Hoatson and Geo. E. Tener, directors; S. A. Parnall, superintendent; J. R. Silvia, mine foreman.

Lands, 12 claims, area 200 acres, held under bond and lease. Property is surrounded by lands of the Copper Queen, Calumet & Arizona, Lake Superior & Pittsburg, and Wolverine & Arizona, two of which are developed properties, with a third showing large ore bodies and the fourth likely to find ore in a short time. Formation and general surroundings are exceptionally encouraging, Development is by a 500′ shaft, which cut a little copper occasionally in sinking. Property is also being developed by a drift from the 850′ level of the Calumet & Arizona, which, at the close of 1903, had just reached the Black Bear claim,of the Pittsburg & Duluth, and there showed ledge matter with a little mixed ore, all of very favorable appearance. This drift, breasted about 300′ from the shaft and running considerably below the shaft bottom, will be connected therewith by an upraise, affording ventilation and exit in case of emergency. Equipment include a 6-drill air compressor and hoist. The property is regarded as practically certain to make a large and rich mine.

PITTSBURG & HECLA DEVELOPMENT CO. ARIZONA.

Office: 1110 Farmers Bank Bldg., Pittsburg, Pa. Mine office: Bisbee, Cochise Co., Ariz. Employs about 20 men. Organized 1903, with capitalization $400,000. Wm. C. Temple, president; D. H. Collins, general manager; Thos. Tate, superintendent. Lands are the Gold Hill group in the Solomon Springs district, about 3½ miles southeast of Bisbee. Lands show a limestone formation with considerable iron ore and much manganese, giving decidedly promising indications of copper ore values underneath. Development is by a 280′ two-compartment shaft, with drifts on the 200′ level. Equipment includes an 80-h. p. steam plant with double-drum hoist, office building, boarding-house, bunk-house and several dwellings.

PITTSBURG & MONTANA COPPER CO. MONTANA.

Office: 401 Tradesmen's Blk., Pittsburg, Pa. Mine office: Butte, Silver Bow Co., Mont. Is a close corporation, with lands and improvements all paid for in cash, and asks neither cash or notoriety. J. H. Reed, president; D. E. Jackson, treasurer; Ralph L. Baggaley, manager; Wm. M. Kirkpatrick, superintendent; C. M. Allen, smelter superintendent. Lands, about 2 miles east of the center of Butte, are quite extensive, including the McQueen placer and adjoining claims, formerly owned by Franklin Farrell. In addition to this main property in Butte, the company bought, in 1903, the Swissmont mines, near Elkhorn, Jefferson county, and the Chamounix property, near Austin, Choteau county, Montana. The Austin property includes the Christina group of 7 claims and the Fannie Parnell group of 33 claims, near Austin, 15 miles from Helena, the Christina group having considerable development and having shipped more or less argentiferous copper ore. The property is to be extensively developed for pyritic ores, required in connection with Butte ores, which being largely chalcocite, rather than chalcopyrite, are somewhat deficient in sulphur. The Elkhorn properties, bought for $60,000, show a large body of low-grade pyritic ore, carrying 1.5% to 3% copper, of a grade character especially adapted to ideal pyritic smelting.

The Butte mine, formerly known as the McQueen and the Farrel, has silicious sulphides, supposed to be a continuation of the veins of the Butte & Boston. Owing to the great depth of overburden, the solid ledge was not reached until a depth of several hundred feet, and shaft sinking was difficult owing to the existence of considerable quicksand above the ledge. No. 2 shaft, 1,200′ deep at the close of 1903, has a hoist good for a depth of 1,500′ and has been extensively opened, although no stoping has been done. No. 3 shaft, 900′ deep, is supposed to have cut the ore body late in 1903, and is being equipped with a hoisting plant. The principal vein of the property is about 30′ wide, carrying chalcocite giving assays up to 17% copper, and said to average about 10%, though probably somewhat lower. The company has pursued an exceptionally secretive policy and has fenced in a quarter mile square with a 12′ board fence, which surrounds the shafts and smelter. Inside of the enclosure a number of buildings have been constructed, these including a handsome office equipped with library, reception-room, billiard-room and café.

The reduction plant, connected by track with the north shaft, is known as the Pittsmouth smelter, and is very substantially constructed, having room for three 400-ton furnaces and 4 smaller furnaces, with one large furnace nearly completed at the close of 1903. This furnace is apparently a modification of the Garretson pyritic smelter, and will have automatic feed. Ignition will be secured by coke, or possibly by petroleum, with which some experiments have been made, but the sulphur is expected to furnish all heat required for reduction, after the first ignition, rendering the process a form of ideal pyritic smelting. The ores from the mine will not be concentrated and will have no preliminary roasting. The disseminated chalcocite of the Butte ores will be mixed with ores from the Austin and Elkhorn properties that are richer in sulphur, and also with custom ores before charging. The company is in the market for custom ores, and is especially desirous of obtaining sulphide ores high in iron. The smelter is to be connected by spur with the Great Northern Railway. The company has water power near Woodville, Jefferson county, which may be improved later.

The Pittsburg & Montana is backed by strong people, a number of whom have been previously identified with successful mining ventures, and has the most promising new property in the Butte district, though it is hard to understand just what good end is served by the secretive policy pursued. However, as the company pays all bills promptly and is asking no public support of any sort, it has a right to conduct its affairs with whatever degree of publicity or secrecy may seem desirable to its management.

PITTSBURG & MOUNT SHASTA GOLD MINING & MILLING CO. CALIFORNIA.

Mine office: Redding, Shasta Co., Cal. B. N. Scott, president; John Paris, secretary. Lands are the Bennington group, adjoining the Mountain

Copper Co., showing ores assaying from $4 to $300 per ton in gold, silver and copper. Ore is to be shipped to the Keswick smelter for reduction. Property is considered promising.

PITTSBURG & UTAH GOLD, SILVER, COPPER & LEAD MINING CO. **UTAH.**

Said to have property in the Ophir district of Tooele county, Utah.

PLAKALNITZA MEDNA PLANINA. **BULGARIA.**

Mine office: Plakalnitza, Vratza, Bulgaria. Held by M. Mavrokordato, Constantinople, Turkey, as a concession from the Bulgarian principality. Property shows bornite and a little chalcopyrite, in dolomite. Copper mines were worked in this vicinity by the Romans.

PLANET COPPER MINING CO. **ARIZONA.**

Office: 31 State St., Boston Mass. Mine office: Planet, via Yucca, Yuma Co., Ariz. Organized August 14, 1902, under laws of Arizona, with capitalization $1,500,000, shares $10 par. Is free from debt. J. Stanley Jones, president; Geo. H. Kimball, secretary; H. L. McCarn, superintendent. Lands, 20 claims, area 400 acres, also 35 acres in millsites and miscellaneous lands, in the Harewan district, on the Bill Williams fork of the Colorado river. Ore occurs as bedded veins and lenses, with about 50 different exposures, veins being contacts between diorite and sedimentary shales. Four ore bodies are being developed, these showing oxide, carbonate and silicate ores, the sulphide zone not having been reached, giving average assays of upwards of 10% copper, without gold or silver values. Mine has about 3,000 tons of ore on the dumps, with about 10,000 tons blocked out for stoping.

Mine was opened 1863-1864 and was again worked in a small way in 1874 and 1884, and was reopened by present owners in 1902. Development is by 12 shafts of 20′ to 120′ in depth, 3 inclines of 185′, 290′ and 325′, and 8 tunnels, longest 225′, with about 2,000′ of underground openings. Has 12-h. p. and 22-h. p. Fairbanks & Morse gasoline hoists. Surface improvements include a smithy, assay office, boarding-house and 3 dwellings, also a smelter with a 30-ton round cupola, not in blast. For 1904 the company plans continuation of the incline on a contact vein until the sulphide zone is reached, and installation of air compressor and power drills. The building of a large smelter will be deferred until the nature of the sulphide ores is determined. This property has produced upwards of $500,000 worth of high-grade ore, ranging from 15% to 40% in copper, and is regarded as valuable.

PLATA COBRE MINING & TRANSPORTATION CO. **ARIZONA.**

Office: 415 Jackson Bldg., Denver, Colo. Mine office: Shultz, Pinal Co., Ariz. Wm. R. Benzie, president; John M. Shrote, secretary and treasurer; A. R. Benzie, superintendent. Lands include the Christmas Gift property, south of Casa Grande, bought September, 1903, ores of which carry silver, copper and gold.

PLATA COPPER MINING CO.

Promoted by the notorious Wernse gang. Utterly worthless.

MINA LOS PLATINOS. **MEXICO.**

Letter returned unclaimed from Fuerte, Sinaloa, Mexico.

PLATTE CANON MINING CO. **WYOMING.**

Mine office: Wheatland, Laramie Co., Wyo. Thos. Hunton, superintendent.

PLENTY COPPER CO. **ARIZONA.**

A stock peddling scheme promoted by the Wernse gang of swindlers. Claims to have lands in Pima county, Arizona.

PLUMAS COPPER MINING & SMELTING CO. **CALIFORNIA.**

Letter returned unclaimed from Susanville, Plumas Co., Cal.

PLUTO GOLD & COPPER MINING CO.

Organized Dec. 16, 1902, under laws of Colorado. Location unknown.

PLYMOUTH ROCK MINE. **CALIFORNIA.**

Mine office: Milton, Calaveras Co., Cal. T. T. Lane, owner; A. W. Collins, superintendent. Ores carry gold, silver, lead and copper. Has water-power and 10-stamp mill, employing 10 to 15 men.

POCAHONTAS MINE. **CALIFORNIA.**

Office: care of Mrs. Abby Waller, owner, Merced, Mariposa Co., Cal. Area, 160 acres. Has several veins of cupriferous iron ore, between dioritic walls, vein matter being mainly diabase and altered diabase. Principal vein is about 100′ wide and the mineral belt is 1,000′ wide in places. Ore bodies, in lenses, are said to carry 6% to 12% copper and $2.50 gold per ton. Has been a limited producer of high-grade carbonate and oxide ores, above the 100′ level, ore below being sulphide.

POCATELLO GOLD & COPPER MINING CO. **IDAHO.**

Office and mine: Pocatello, Bannack Co., Idaho. Employs 3 men. Organized Dec. 1, 1902, under laws of Idaho, with capitalization $1,000,000, shares 50 cents par. E. Craanson, president; J. J. Guheen, secretary; N. M. Eldredge, general manager; Jos. E. Munn, superintendent. Lands, 7 claims, area 140 acres, including the Moonlight claim, in the Fort Hall district, showing a vein of about 3′ average width, said to give assays of 40% copper and 75% lead (total 115%) with 35 oz. silver and $1 gold per ton, from bornite and chalcopyrite. This is evidently very rich ore, as veins carrying 115% in metallic values are unusual, even in Idaho.

POLAND EXTENSION GOLD MINING CO. **ARIZONA.**

Mine office: Poland, Yavapai Co., Ariz. John Gray, superintendent. Has cupriferous gold and silver ores, with steam power, and employs about 25 men.

POLAND-HAMILTON MINE. **ARIZONA.**

Mine office: Providence, Yavapai Co., Ariz. Gage & Murphy, owners. John Gray, superintendent. Ores carry gold, silver and copper. Has steam power.

POLARIS MINING & MILLING CO. **ARIZONA.**

Office: care of J. B. Schmitz, Denton, Texas. Mine office: Clifton, Graham Co., Ariz. A. S. Eyler, secretary; E. W. Beauchamp, general manager. Lands, 19 claims, laying northeast of the Clifton Consolidated and New England. Country rock is granitic, ore bodies occurring near parallel porphyritic dykes, with oxide, carbonate and altered sulphide ores, associated with gold-bearing quartz, and having a clay gangue. Shows auriferous and argentiferous chalcopyrite in the lower workings. Has steam and gasoline power and a 20-stamp milll.

PONDILLAI & VOLCAN GROUP. NEW CALEDONIA.

Mine office: Diahot, New Caledonia. Slightly developed prospects.

PONTIAC GOLD & COPPER MINING CO. NEW MEXICO.

Letter returned unclaimed from Tres Piedras, Taos Co., N. M.

PONTIAC MINING CO. VIRGINIA & NORTH CAROLINA.

Office: 19 Liberty St., New York. Mine office: Virglina, Halifax Co., Va. Employs 16 men. Organized 1902, under laws of New York, with capitalization $1,600,000, shares $10 par. A. A. Sumner, president; Samuel Bryant, secretary; Robt. G. Lossiter, general manager. Lands, 1,340 acres, in the Virgilina district of Virginia and North Carolina, with a fissure vein in schist, opened by the Tuck shaft of 125′ and the Glasscock shaft of 203′ showing cuprite, malachite and azurite to depth of 60′, with lower portions showing chalcocite, bornite and chalcopyrite, with quartz and epidote gangue, giving average assays of 4% copper and 1 oz. to 2 oz. silver per ton, with traces of gold. Has gasoline power.

POOLE GROUP. ARIZONA.

Mine office: Washington, Santa Cruz Co., Ariz. E. M. Ray, superintendent. Ores carry copper, gold, silver and lead. Has steam power and employs about 20 men.

POONA & MATTA DARRA MINES. AUSTRALIA.

Office: care of C. H. Hussey, Broken Hill Chambers, Adelaide, South Australia. Lands, 240 acres, adjoining the Moonta mine, on the Yorke Peninsula, South Australia. Has shafts of 120′ and 228′, showing rich ore in promising quantities.

PORCUPINE MINE. COLORADO.

Office: Ashcroft, Pitkin Co., Colo. M. B. Sweeney, owner.

PORTAGE LAKE & BISBEE MINING CO. ARIZONA.

Office: 12 First National Bank Bldg., Hancock, Mich. Mine office: Bisbee, Cochise Co., Ariz. Employs 12 men. Organized April, 1903, under laws of Arizona, with capitalization $1,000,000, shares $1 par, succeeding the Portage Lake & Calumet Development Co. John Funkey, president; Wm. H. Mason, vice-president; Wm. Condon, secretary; J. E. O'Neill, treasurer; Gus Funkey, superintendent. Lands, 9 full and 3 fractional claims, area 200 acres, patented and owned in fee, 3 miles southeast of Bisbee, with boundary line 1,800′ southeast of Calumet & Cochise. Formation is limestone, with a porphyry contact. Has a 300′ shaft with two compartments, each 4′ 6″ square and well timbered. Shaft is proving very wet and sinking is temporarily suspended, steaming capacity being insufficient to handle water and operate air compressor and hoist simultaneously. Has a small air compressor and Worthington sinking pump and has ordered a 75-h. p. hoist. Has a boarding-house, bunk-house and smithy and plans beginning diamond drilling. While no ore has been found in the shaft, indications are pronounced favorable by those best acquainted with the Warren district.

PORTAGE LAKE & CALUMET DEVELOPMENT CO. **ARIZONA.**

Reorganized, April, 1903, as Portage Lake & Bisbee Mining Co.

PORTLAND COPPER MINING CO. **WYOMING.**

Mine office: Battle, Carbon Co., Wyo.

PORTLAND MINING CO. **BRITISH COLUMBIA.**

Office: 19 North Seventh St., Terre Haute, Ind. Mine office: Aspen Grove, B. C. Employs 5 to 10 men. Organized 1901, under laws of British Columbia, with capitalization $15,000, shares 1 cent par, strictly non-assessable. Andrew J. Crawford, president; M. T. Hidden, secretary; J. E. Bate, general manager. Lands, 4 patented claims, area 204 acres, also 160 acres miscellaneous lands, in the Aspen Grove district, showing 10 veins, of which 2 under development give assays of 15% copper, 3 oz. silver and 80 cents gold per ton, from carbonate and sulphide ores. Has a 155′ shaft and 32′ tunnel. Plans building a $20,000 smelter.

PORTLAND-IMNAHA COPPER MINING CO.

Disincorporated September, 1903, with all debts paid.

PORTLAND (ROSSLAND) MINE, LTD. **BRITISH COLUMBIA.**

Offices: 23, Leadenhall St., London, E. C., Eng. Mine office: Rossland, B. C. H. Frisby, Jr., chairman; W. A. Stearns, secretary; S. S. Sörenson, mine manager. Capital, nominal, £120,000. Lands, 50 acres, on Sophie Mountain, Rossland.

PORVENIR DE SONORA CO. **MEXICO.**

Reorganized, 1902, as Coast Line Copper Co.

POSTAL GOLD, PLATINUM & COPPER MINING CO. **WYOMING.**

Office: 901-188 Madison St., Chicago, Ill. Mine office: Rambler, Carbon Co., Wyo. H. G. Richardson, president and general manager; B. J. Sommer, secretary. Lands, 5 claims, area 100 acres, in the Battle Lake district, 800′ from the Doane-Rambler mine of the Battle Lake Tunnel Site Mining Co., opened by a 60′ shaft and tunnel, with about 1,500′ of underground openings, showing a ledge about 300′ wide, from which a little native copper and covellite, assaying up to 55% copper and carrying gold and platinum, have been secured. Officers of company said to stand well, but all attempts to learn capitalization or secure other information have been ineffectual.

COMPANIA MINERA POTOSINA. **MEXICO.**

Office: P. O. Box 68, San Luis Potosi, Mex. Mine office: Charcas, S. L. P., Mex. Carlos Uhden, manager. Operates Guadalupe y Anexas mines.

EL POTRILLO MINE. **MEXICO.**

Mine office: Indé, Durango, Mexico. Victoriano Mantos, owner. Ores carry copper and silver. Has steam power.

NEGOCIACION MINERA DE POZOS. **MEXICO.**

Mine office: Pozos, Guanajuato, Mex. Operates Santa Brigida y Anexas, Santa Lucia and La Argentina mines, producing gold, silver and copper, atter as a by-product. Has steam power and works several hundred men.

PRATT PYRITES MINES. **GEORGIA.**

Mine office: Dahlonega, Lumpkin Co., Ga. Ores are cupriferous and auriferous iron pyrites, carrying up to 2% copper and $2 gold per ton. Management purposes installing a concentrator and acid plant.

PRESIDENTIAL MINING CO. **ARIZONA.**

Mine office: Patagonia, Santa Cruz Co., Ariz. W. G. Dumont, superintendent. Ores carry silver, lead and copper.

PRESTON PEAK COPPER CO. **CALIFORNIA.**

Office: 20 Broad St., New York. Unknown by postmaster at former mine office, Yreka, Siskiyou Co., Cal. Organized 1898, under laws of West Virginia, with capitalization $2,500,000. Chas. A. Lieb, president; D. J. Newland, secretary. Lands, 5 claims, 1½ miles north of Preston Peak, Country rock is diorite and ore bodies consist of a succession of chutes, some having a width of 20′ to 30′, carrying chalcopyrite disseminated in pyrite, said to average 10% copper, with small gold values.

PREUSSISCH-BRAUNSCHWEIG'SCHE GEMEINSCHAFTS WERKE. **GERMANY.**

Office and works: Oker, Germany. Is the smelting plant maintained in connection with the Rammelsberg mine.

PRIDE MINING CO. **COLORADO.**

Mine office: Montezuma, Summit Co., Colo. H. T. Crawford, superintendent. Operates the Aorta, Yellowjacket and other mines, carrying silver, lead and copper. Has steam power and a 50-ton concentrator, employing about 40 men.

PRIDE OF ARIZONA COPPER CO. **ARIZONA.**

Office: 66 Broadway, New York. Mine office: McCabe, Yavapai Co., Ariz. Harry C. Hart, president; H. H. Douglass, secretary; L. Greenwood, superintendent. Ores carry gold, silver and copper. A Douglass-Lacy promotion.

PRIDE OF THE WEST MINING & MILLING CO. **ARIZONA.**

Office: 1801 Fifteenth St., Denver, Colo. Mine office: Washington, Santa Cruz Co., Ariz. Arthur R. Wilfley, president; Herbert E. Fiske, secretary. Organized May 1, 1901, under laws of Colorado, with capitalization $1,500,000, shares $10 par. Has paid one dividend of $15,000. Lands, about 350 acres. Mine opened 1870; reopened 1897; closed 1902. Deepest shaft about 300′. Ores carry silver, copper, lead and zinc. Has a 200-ton concentrator. Idle. Fully described in Volumes II. and III.

PRINCE MINING & DEVELOPMENT CO., LTD. **BRITISH COLUMBIA.**

Mine office: Revelstoke, Northwest Kootenay district, B. C. Owns *the* Standard group of 11 claims, with 1,300′ of underground development. Vein is 5′ to 8′ wide, showing slightly auriferous and argentiferous chalcopyrite, said to average 10% copper. Was developing at last accounts.

PRINCESS ADA MINE. **WASHINGTON.**

Office and mine: Marcus, Stevens Co., Wash. Chas H. Alban, owner.

PRINCESS ROYAL GROUP. **BRITISH COLUMBIA.**

Owned by Capt. John Irving, et al, Victoria, B. C., and under bond to James Findlay, et al, of St. John, N. B. Lands, 120 acres. Ores carry gold, silver and copper, and have returned values of $120 per ton from smelter shipments. Vein is 4' wide, with pay-streak of 18" to 24".

PRINCESS ROYAL GOLD & COPPER MINING CO. **BRITISH COLUMBIA.**

Office: New Whatcom, Wash. Henry W. Parrot, president; Samuel D. Slentz, secretary. Lands, sundry claims on Princess Royal Island, ores from which have given assays very high in copper, with $4 to $10 gold per ton.

PRINCETON COPPER MINING & SMELTING CO. **ARIZONA.**

Office: 39 Cortlandt St., New York. Mine office: Ft. Huachuca, Cochise Co., Ariz. Henry Hamburg, president and general manager; Henry C. Adams, vice-president and treasurer; Herbert N. Karner, secretary; C. S. Wright, superintendent. Organized 1901, under laws of South Dakota, with capitalization $2,500,000, shares $1 par; $1,000,000 unissued. Company is free from debt. Lands, 3 patented and 3 unpatented claims, area 120 acres, in the Hartford district, Huachuca mountains, giving assay of 10% and upwards in copper and 10 oz. to 50 oz. silver per ton, with small gold values, from malachite, chalcocite and bornite. Adjoining gold claims of the company show high values in free-milling quartz. Has 4 shafts, deepest 80', and tunnels of 60', 70', 115' and 250'. Property was opened, circa 1880, by Ben Williams, and is near the Huachuca Consolidated. Company is honestly and conservatively managed and property is regarded as promising.

PRO PATRIA MINING & MILLING CO. **COLORADO.**

Mine office: Rico, Dolores Co., Colo. W. J. Scoutt, superintendent. Ores carry gold, silver, lead and copper. Has water and electric power and a 50-ton concentrator. Employs about 50 men.

PRODIGAL SON MINE. **CALIFORNIA.**

Office and mine: care of E. P. Loring, Cayucos, San Luis Obispo Co., Cal. Has limited development by shaft and tunnel, showing a vein of about 7', carrying auriferous and argentiferous chalcocite in quartz gangue, and traversing syenite and serpentine.

PRODUCE COPPER CO. **ARIZONA.**

Mine office: Mayer, Yavapai Co., Arizona.

PRODUCER MINING & SMELTING CO. **ARIZONA.**

Office: 510-125 La Salle St., Chicago, Ill. Mine office: Casa Grande, Pinal Co., Ariz. Employs 35 men. J. W. McCoy, president; E. R. Zimmerman, secretary; Frank Brownell, superintendent. Lands include the Jack Rabbit group of 80 acres, in Pinal county, the Producer and Century-Chief group of 320 acres and the Index group of 220 acres in Pima county, Arizona, giving a total area of 620 acres. Property is held under $30,000 bond and lease, on which $14,000 has been paid. Main shaft is 200′, with about ½ mile of underground openings, said to show 52,000 tons of auriferous and argentiferous copper ore. Had a 50-ton smelter nearly completed at close of 1903.

EL PROGRESO MINE. **MEXICO.**

Mine office: care of A. E. Turner, owner, Sabinal, Chihuahua, Mex. Ores carry silver, copper and lead. Has steam power.

EL PROGRESO COPPER MINING CO. **MEXICO.**

Office: 67 Wall St., New York. Mine office: Ayutla, Jalisco, Mexico. Organized under laws of South Dakota, with capitalization $1,500,000, shares $1 par. David B. Russell, president and general manager, Guadalajara, Mex.; James H. Hornby, secretary. Lands, about 80 acres, including "antiguas" supposed to have been worked by Aztecs and Spaniards. Ores claimed to carry 12% copper, a trace of gold and 12 oz. silver per ton. Company made unreasonable promises of dividend returns when organized, and is apparently on the high-road to ruin, through dissensions and lawsuits.

PROMONTORIO MINE. **MEXICO.**

A copper-gold property northwest of the city of Durango, Durango, Mex., said to be owned by an Anglo-German company, and to have large ore bodies. Was erecting a 100-ton concentrator and small matting furnace at last accounts.

PROMONTORIO MINING & SMELTING CO. **MEXICO.**

Mine office: Moctezuma, Sonora, Mex. Ores carry copper, gold and silver. Has steam power and a small smelter.

PROSPER GOLD MINING CO. **NEW MEXICO.**

Mine office: Hillsboro, Sierra Co., N. M. A. J. Hirsch, manager. Ores carry gold, silver and copper. Has steam power.

PROSPERITY MINE. **ARIZONA.**

Said to be under development in Copper Basin, Arizona.

PROTECTARO MINE. **MEXICO.**

Office and mine: care of F. B. Najara y Ca., owners, Topia, Durango, Mex. Ores cary gold, silver and copper. Employs about 50 men.

PROVIDENCE GOLD & COPPER CO. **CALIFORNIA.**

Office: 617 Homer Laughlin Bldg., Los Angeles, Cal. Mine office: Goldstone Camp, Fenner, via Blake, San Bernardino Co., Cal. P. H. Mathews, president; W. E. Baxter, vice-president and treasurer; A. Samuel Parks, secretary; F. H. Messmore, auditor. Organized November 2, 1901, under laws of Arizona, with capitalization $3,000,000, shares $1 par. Is free from debt and has a little cash on hand. Lands, 15 claims, also 8 millsites, area 339 acres, patents applied for, in the Arrow Weed district, showing 15 fissure veins carrying sulphide ores assaying about 1% copper and $4 to $1,000 gold per ton, with small silver values. Has several shafts, all under 100′, with numerous pits and cuts, also tunnels of 155′, 226′, and 381′, giving a total of 2,100′ of underground openings. Will continue development work during 1904. Company is composed of men of excellent personal standing and property regarded as promising.

MINA LA PROVIDENCIA. **MEXICO.**

Mine office: Gavilanes, Durango, Mex. Anastasio Lugo, owner and manager. Ores carry silver and copper. Has a 130′ main shaft, with water power, and employs about 40 men.

PRUDENTIAL GROUP. **CALIFORNIA.**

Office: care of H. S. Reed, manager, Medford Ore. Lands, near Shelly Creek, Del Norte Co., Cal. Opened to limited extent by shaft and tunnel, showing 2 veins, 25′ to 30′ in width. Ore is pyrrhotite, carrying copper, gold, silver and zinc in small percentages.

PRUDENTIAL COPPER MINING CO. **ARIZONA.**

Office: 18 Custom House Pl., Chicago, Ill. Letter returned unclaimed from former mine office, Prescott, Yavapai Co., Ariz. Shea Smith, president; E. Haggott, consulting engineer.

PRUDENTIAL MINING & DEVELOPMENT CO. **ARIZONA.**

Letters returned unclaimed from Nogales, Santa Cruz Co., Ariz. Lands, 12 claims, adjoining the Buena Vista group of the Nogales Copper Co.

PSYCHE MINING CO. **OREGON.**

Office: Omaha, Neb. Mine office: Greenhorn, Ore. J. Fawcett, manager. Ores carry gold, silver and copper. Has steam power and a 20-stamp mill.

PUERTECITO COPPER CO. **MEXICO.**

Assets, a lawsuit against Col. W. C. Greene.

PUGET SOUND COPPER MINES. **BRITISH COLUMBIA.**

Mine office: Van Anda, Texada Island, B. C. Wm. Law, superintendent. Has a copper ore body with a heavy gossan capping of fair-grade iron ore.

PUGET SOUND INVESTMENT CO. **BRITISH COLUMBIA.**

Letter returned unclaimed from former office, Irondale, Washington. Had copper claims near Gillies Bay, southwestern Texada Island, B. C.

PUGET SOUND REDUCTION CO. **WASHINGTON.**

Office and works: Everett, Snohomish Co., Wash. Has three 30x180″ blast furnaces, one of which is running on copper ores, producing a matte averaging 50%, which is blown up to blister copper in a reverberatory furnace and shipped east for electrolytic refining. This plant is the only commercial producer of arsenic in the United States, making about five tons daily, from Monte Cristo ores.

PUGWASH RIVER COPPER CO. **NOVA SCOTIA.**

Office: care of Alfred P. Merchant, secretary, Gloucester, Mass. Organized November 3, 1903, under laws of Massachusetts, with capitalization $100,000, divided into $40,000 of 7% preferred and $60,000 of common stock, all issued. Lands, 320 acres, on the upper Pugwash river, in Cumberland county, Nova Scotia, said to show chalcocite in sandstone.

PULIDO MINING CO., LTD. **PORTUGAL.**

Offices: 5-6, Great Winchester St., London, E. C., Eng. J. Silva, chairman; C. E. Wilkey, secretary. Capital, nominal, £165,000. Lands, 22 mineral concessions in the Baja district, province of Alemtejo, Portugal. Idle.

COMPANIA DE MINAS Y FUNDICION DE PUQUIOS. CHILE.

Mine office: Los Puquios, Rancagua, Chile. Operates the Santa Rita, Ricardita, Morada and Magdalena mines, opened 1897, on a considerable scale. Has steam power and smelter, employing several hundred men.

PURITAN COPPER & GOLD MINING CO. NEW MEXICO.

Supposed to have had lands near Tres Piedras, Taos Co., N. M. Benj. F. Coburn was promoter and president. Company guaranteed 10% dividends for five years, when selling stock, and present address is unknown.

PYNE SMELTING CO. CALIFORNIA.

Office: 26 First National Bank Bldg., San Francisco, Cal. Works office: West Alameda, Alameda Co., Cal. P. W. Pyne, manager; Geo. H. Hand, superintendent. Works have a daily capacity of 100 tons, but are idle, owing to litigation with gardeners in the vicinity. Company is said to be reopening the Mackay-Ryan mine, near Stent, California.

PYRAMID COPPER CO.

Organized 1902, with capitalization of $500,000—$300 paid in.

PYRAMID COPPER SYNDICATE, LTD. BRITISH COLUMBIA.

Offices: Moorgate Station Chambers, London, E. C., Eng. W. Smith, secretary. Capital, nominal, £20,000. Lands, 16 claims at Pyramid Camp, East Kootenay, British Columbia.

PYRAMID GOLD & COPPER MINING CO. ARIZONA.

Office and mine: 19 Bashford Bldg., Prescott, Yavapai Co., Ariz. W. W. Munds, general manager. Capitalization $1,200,000, shares $1 par. Lands, 12 claims, area about 200 acres, 5 miles from Skull Valley station, opened by a number of shafts of 25′ to 75′ depth on a 7′ vein assaying 7% copper and $1 gold per ton from sulphide ore.

PYRENEES COPPER MINES, LTD. FRANCE.

Offices: 3, Union Court, London, E. C., Eng. C. Browne, secretary. Capital, nominal, £150,000. Lands, 1,704 acres, in the department of Basses Pyrenees, France.

PYRENEES MINERALS, LTD. FRANCE.

Offices: 32, Great St. Helens, London, E. C., Eng. Sir R. Baillie, chairman; J. Gray, secretary. Capital, nominal, £160,000: issued, £85,000; debentures, £60,000 first mortgage 6%. Lands, 1,818 acres, including Alzen silver and copper mines in the department of Ariege, France. Has a 20-ton smelter.

PYRITE KING COPPER MINING CO. SOUTH DAKOTA.

Office: Pipestone, Minn. Property is in the Black Hills of South Dakota.

PYTHON GROUP. BRITISH COLUMBIA.

Claims near Kamloops, B. C. Said to have been bought by Montreal and New York capitalists, who purpose extensive developments.

Q. S. GOLD MINING & SMELTING CO. WASHINGTON.

Office: Spokane, Wash. Mine office: Conconully, Okanogan Co., Wash. S. E. Barron, superintendent. Ores carry gold and copper.

QUARTETTE MINING CO. **NEVADA.**

Office: 19 Milk St., Boston, Mass. Mine office: Searchlight, Nev. F. J. Harrington, superintendent. Mine is primarily of gold, with silver and copper as by-products. Has steam and gasoline power, 35-stamp mill and 100-ton cyanide plant, employing about 75 men.

QUEBEC COPPER CO., LTD. **BRITISH COLUMBIA.**

Letter to Deadwood, B. C., returned unclaimed.

LA QUEBRADA GROUP. **VENEZUELA.**

Includes the principal mines of the Quebrada or Aroa district of Venezuela, which have produced about 60,000 tons of fine copper. Group includes the Cumuragua mine, having a vein of carbonate ore 1′ to 5′ wide; the Titiara mine with vein 2′ to 25′ wide; the San Antonio mine, with vein of 3′ to 18′, and the Quebrada mine, with a vein 50′ to 75′ wide, 2,000′ long and of unknown depth, from which oxide and carbonate ores have been mined in the alteration zone, leaving a large body of sulphide ore, averaging probably 5% to 6% copper, in the lower workings. Idle since 1894, but at some future time, when Venezuela is given a settled government, must become one of the world's big mines, as the considerable production already secured is merely the cream skimmed from a big pan of milk.

QUEEN MINING & MILLING CO. **NEW MEXICO.**

Mine office: Cooney, Socorro Co., N. M. G. Brown, superintendent. Lands include the Copper Queen mine, producing copper, gold and silver. Has steam power and a 15-stamp mill.

QUEEN OF ARIZONA COPPER CO. **ARIZONA.**

Office: 517-10 Wall St., New York. Mine office: 26 Lawler Bldg., Prescott, Yavapai Co., Ariz. Capitalization $5,000,000, shares $1 par. F. A. Tuttle, president; E. N. Darling, secretary. Company is a development and promotion corporation and has extensive holdings in various subsidiary mining companies. Supposed to have consolidated in 1902 with the Belcher Gold Mining Co., Bullwhacker Mining Co., Empress Mining Co., and Sunlight Mining Co., under the hideous title of Great Belcher-Bullwhacker Gold Mining Co. Name apparently put the property to sleep, as nothing has been heard from it for two years.

QUEEN BEE GROUP. **ARIZONA.**

Mine office: Kingman, Mohave Co., Ariz. Is opening the White Copper mine.

QUEEN BEE MINING CO. **AUSTRALIA.**

Mine office: Cobar, Robinson Co., N. S. W. Australia. Is developing claims in the Bee Mountains, 11 miles southeast of Cobar, showing a 50′ vein giving assays up to 45% copper, with fair gold and silver values.

QUEEN OF BRONZE MINE. **OREGON.**

Office: care of Wm. Tufts, Denver, Colo. Mine office: Takilma, Josephine Co., Ore. J. P. Murphy, superintendent. Ores are auriferous sulphides, assaying 12% to 60% copper. Has steam power and is sinking a 600′ shaft.

QUEEN VICTORIA MINE. **BRITISH COLUMBIA.**

Mine office: Beasley, B. C. Has a big bluff of copper ore, claimed to be

300′ wide and 400′ long, with rhyolite walls. Is claimed property can work profitably on ores of $4 per ton value.

QUEEN OF THE WEST MINING CO. COLORADO.

Mine office: Central City, Gilpin Co., Colo. L. C. Moe, superintendent. Ores carry gold, silver and copper. Has steam power.

QUEENSLAND COPPER CO., LTD. AUSTRALIA.

Offices: 6, Princes St., London, E. C., Eng. Mine office: Mt. Perry, Queensland, Australia. Employs about 300 men. Capital, nominal, £500,000, half in 6% cumulative preference and half in ordinary shares; issued, £171,772. Is a dividend payer. Geo. Grinnell-Milne, chairman; Allan Gibb, mine manager; J. S. MacArthur, consulting engineer; J. G. Tait, secretary. Lands include the Mt. Perry and Reed's Creek mines, area 650 acres, freehold, also the Great Freehold mine, area 811 acres, all in the vicinity of Mt. Perry, Herberton district, Queensland. The Great Freehold has a nearly vertical fissure vein in granite, averaging about 5′ wide and having an 18″ paystreak carrying chalcopyrite averaging about 14% copper, with fair gold and silver values, opened by a 200′ main shaft. The Mt. Perry and Reed's Creek mines have similar fissure veins in granite, the main vein being about 12′ wide, with pay-streak averaging 7″ to 8″ width on the upper levels and 10″ on the lower levels, giving returns of about 16% copper. These mines have 15 shafts, of 120′ to 800′ depth, with ore reserves of about 30,000 tons. The company also works the Greenback, Potosi and Wolca mines, in the Wolca district, and the Boolboonda and Edena mines, carrying auriferous and argentiferous copper ores, in the Boolboonda district.

The smelter, built at Mt. Perry, in 1902, has one 40-ton and one 90-ton water-jacket blast furnace, and it is planned to install a converter plant. The smelter is connected with the principal mines by a tram-line, and also does custom smelting. In 1902 the production of the company was 861 long tons of copper, 24,700 oz. silver and 260 oz. gold, from 5,160 tons ore smelted, giving average smelter returns of 16.6% copper, 4.7 oz. silver and 0.05 oz. gold per long ton. In November, 1903, the production was 185 tons of matte, carrying 128 tons of refined copper, made from 800 tons of ore, giving an average of 16% copper from ore smelted. The property is well handled, and while its veins are small they are persistent, and the ore is rich.

QUEENSLAND MINES EXPLORATION CO. AUSTRALIA.

Dead.

QUEENSLAND SMELTING CO., LTD. AUSTRALIA.

Offices: Dashwood House, London, E. C., England. Works office: Aldershot, Maryborough, Queensland, Australia. Chas. Poston, chairman; Arthur Kift, secretary and managing director. Capital, £50,000, in £30,000 cumulative 5% preference shares and £20,000 ordinary shares. Debentures, £37,800 authorized; £65,000 issued, in £100 bonds at 5%. Property is 1,168 acres, freehold, with smelting plant having furnaces for reduction of copper, gold, silver and lead ores.

QUEENSLAND PIONEERS, LTD. **AUSTRALIA.**

In voluntary liquidation. H. S. Smith, liquidator.

QUICKSILVER MINES, (CALIFORNIA, U. S. A.) LTD. **CALIFORNIA & OREGON.**

Offices: Broad Street House, London, E. C., Eng. W. Allaway, chairman; W. Harvie, secretary. Capital, nominal, £150,000. In addition to cinnabar claims company owns 10 copper claims, area 200 acres, in Del Norte county, California, and Curry county, Oregon.

COMPANIA EXPLOTADORA DE LA MINA DE COBRE QUILILLA. **MEXICO.**

Office: Scranton, Pa. Mine office: Ameca, Jalisco, Mex. Employs 50 to 60 men. Chas. S. Weston, president; John W. Fowler, secretary and treasurer; Independence Grove, general manager; Felix Orozco, superintendent. Lands, 50 pertenencias, area 123 acres, in the Ameca district of Guachinango, showing 2 fissure veins in porphyry, of which one, averaging 4′ to 6′ width, is opened by 5 shafts, of 40′ to 190′ depth, and by 5 tunnels, longest 460′, with about 1,500′ of underground openings. Ores give average assays of about 9% copper, 10 oz. to 25 oz. silver and $3 gold per ton.

QUINCY MINING CO. **MICHIGAN.**

Office: 45 Broadway, New York. Mine office: Hancock, Houghton Co. Mich. Employs about 1,700 men. Incorporated 1848, under special Michigan charter; reincorporated March 6, 1878, for 30-year term, under general mining laws of Michigan. Capitalization $2,500,000, shares $25 par. Wm. R. Todd, president; Chas. J. Devereaux, vice-president; preceding officers, Cleveland H. Dodge, Issac H. Meserve, Danl. T. Brigham and Don M. Dickinson, directors; W. A. O. Paul, secretary and treasurer; John L. Harris, superintendent; Jas. W. Shields, mill superintendent; Thos. Whittle, mining captain; Chas. K. Hitchcock, engineer; Will P. Smith, smelter superintendent; Wm. Bath, smelter clerk; John Funkey, master mechanic; Old Colony Trust Co., of Boston, transfer agent. Dividends for 1903 were $5.50 per share, giving total dividend disbursements of $14,470,000. First dividend was paid 1862 and profits have been divided among shareholders regularly each succeeding twelvemonth, with the exception of the years 1866 and 1867.

Official returns to the state of Michigan, as of date Jan. 1, 1903, disclose the following figures:

Amount cash paid in on capital stock	$2,500,000.00
Amount paid in by conveyance of property to company	1,000,000.00
Entire amount invested in real estate	2,500,000.00
Amount of personal estate	811,207.26
Amount of unsecured or floating debt	223,746.02
Amount due corporation	292,898.80

The following table compares figures of production, income, costs and dividends for the years 1900 to 1903:

	1903.	1902.	1901.	1900.
Mineral, pounds	25,220,220	26,425,620	27,778,268	18,491,749
Copper, pounds	18,498,288	18,988,491	20,540,720	14,116,551
Gross receipts	$2,447,351	$2,275,819	$3,327,071	$2,353,416
Expenditures at mine	1,573,863	1,477,813	1,601,535	1,162,411
Construction account	117,775	96,124	167,192	604,870
Smelting and miscellaneous	234,590	234,978	206,303	157,381
Net mining profit	521,122	466,904	1,352,039	428,754
Other income	17,804	31,096	72,503	21,122
Total net profit	538,926	498,000	1,424,542	449,875
Dividends	550,000	700,000	900,000	900,000
Balances	–11,074	-202,000	+524,542	–450,125

The deficits shown in the preceding table are the differences between net earnings and dividend payments, and came from the surplus.

The following table shows statistics of production, costs, etc., since 1864:

Year.	Product. Pounds.	Yield fine copper per fathom broken. Pounds.	Price obtained. Cents.	Cost per pound exclusive of construction. Cents.	Number of miners.	Average monthly contract wages.
1864	2,498,574	562	44.8	26.7	242	$65.50
1865	2,720,980	501	....	....	212	57.53
1866	2,114,220	451	31.3	29.0	227	53.16
1867	1,921,620	526	22.7	18.9	167	50.83
1868	1,417,941	447	25.2	23.1	157	50.44
1869	2,417,365	446	21.9	16.7	210	51.10
1870	2,496,774	528	21.5	15.3	181	46.09
1871	2,409,501	441	22.8	15.2	104	47.08
1872	2,269,104	391	32.5	22.9	233	60.62
1873	2,621,087	491	26.5	18.6	223	62.40
1874	3,050,154	577	21.9	15.1	234	43.38
1875	2,798,281	485	22.7	15.8	217	46.74
1876	3,073,171	507	20.0	15.7	227	47.13
1877	2,837,014	467	18.6	15.1	247	43.79
1878	2,991,050	395	14.9	14.0	234	41.50
1879	2,639,958	403	16.3	13.7	212	38.76
1880	3,609,250	563	18.5	11.8	192	49.10
1881	5,702,606	766	18.7	10.6	212	48.54
1882	5,682,663	800	17.1	9.5	152	48.83
1883	6,012,239	850	13.7	8.9	165	46.02
1884	5,680,087	722	12.2	8.6	157	43.35
1885	5,848,497	710	11.4	7.5	132	44.00
1886	5,888,517	638	11.1	6.8	140	45.80
1887	5,603,691	781	11.7	8.6	142	48.40
1888	6,367,809	690	15.9	10.1	158	49.60

Statistics of production, costs, etc., since 1864—Continued.

Year.	Product. Pounds.	Yield fine copper per fathom broken. Pounds.	Price obtained. Cents.	Cost per pound exclusive of construction. Cents.	Number of miners.	Average monthly contract wages.
1889	6,405,686	690	12.0	9.4	145	49.15
1890	8,064,253	769	15.7	8.2	146	52.60
1891	10,542,519	685	12.8	9.1	182	53.40
1892	11,103,926	572	11.2	8.8	238	53.75
1893	14,398,477	574	10.4	7.1	259	49.60
1894	15,484,014	584	9.5	5.7	285	50.70
1895	16,304,721	517	10.1	5.9	336	50.00
1896	16,863,477	477	10.9	6.5	379	52.00
1897	16,924,618	481	11.1	6.8	393	52.52
1898	16,354,061	513	12.0	6.8	381	52.50
1899	14,301,182	427	17.0	8.1	401	56.72
1900	14,116,551	391	16,6	9.3	433	62.00
1901	20,540,720	409	16.1	8.8	533	62.00
1902	18,988,491	347	11.9	9.0	562	62.00
1903	18,498,288	325	13.2	9.7	586	62.00

The mine is opened on the Pewabic amygdaloid, which has an average dip of 52° to 54° at surface, and approximately 37° 30′ at a depth of 5,000′ in the lowest workings, the shafts following the pitch of the lode on catenary curves. The average width of the lode is about 20′ in the upper workings, but is materially narrower at the bottom and the copper values are also less, the rock showing very little heavy copper in the lower stopes, but being more uniform in values than above, where it was decidedly bunchy. The lode has an extreme width of 40′ at several points and is only 10′ to 15′ wide in No. 8, the northernmost shaft. About one-third of the production was heavy copper some years ago, but this has decreased to about 15% of the total mineral, though probably 20% of the total refined copper, at present. In the upper levels immense masses were frequently found, these ranging up to 300 tons in weight. The southernmost drifts in the Quincy are under the village of Hancock and nearly 3,000′ below the mean water-level of Portage Lake, while the northernmost workings in the Mesnard shaft are about 8,000′ from the breast of the southern drifts, with about a mile of the lode untouched on the Mesnard and Pontiac tracts north of No. 8 shaft. The walls are strong and little timbering is required, dry walls being built of waste rock in wide stopes, thus saving the cost of hoisting worthless rock and the expense of extra timbering. Fire doors have been installed and every precaution is taken against fire. Miners are carried to and from their work in man-cars holding 30 men. All hoisting cables are inspected frequently and every care taken to prevent accidents. Shafts are sunk mainly in the foot-wall, obviating the necessity of leaving large quantities of lode-rock unmined for pillars.

The Quincy has several cupriferous amydaloids in addition to the Pewabic, and was opened originally in 1848 on the Quincy amygdaloid, a para bed lying some distance west of the Pewabic, but abandoned when the Pe bic lode was opened in 1856. There is a foot-wall branch, known as Pewabic East Lode, underlying and paralleling the main bed, which occas ally yields good returns. The so-called West lode, 300′ west of the Pewabic has been opened by crosscuts from the 36th, 39th, 40th, 44th and 49th levels, showing fairly well on the 39th and 40th levels, but poorly elsewhere. A little work was done on this lode in 1903 on the 39th level, north of No. 7 shaft, and several small bunches of good ground were opened and stoped, but not enough to pay for working. About 150′ west of the West lode is another amygdaloid, averaging 40′ width and carrying more or less copper, which possibly may prove workable. About 1,000′ west of the Pewabic is the Hancock amygdaloid, which was narrow but fairly mineralized where worked in the old Hancock mine.

Owing to the absorption of the Pewabic and Mesnard mines, shafts are numbered irregularly. The southernmost is No. 7, 4,840′ deep to the 56th level; 860′ next north is No. 4, 4,190′ deep to the 51st level; 585′ next north is No. 2, 5,080′ deep to the 59th level; 1,928′ next north is No. 6, 5,060′ deep to the 58th level and 4,168′ north is No. 8, the Mesnard shaft, 2,525′ deep to the 19th level. Extreme distance is 7,541′ between No. 7 and No. 8 shafts, the Franklin mine intervening between shafts 6 and 8.

No. 7 shaft, planned and sunk by Mr. Harris, is on a catenary curve, leaving surface at an angle of 53° but bottomed at about 40°. The shaft was sunk 4,000′ in 18 months, through exceedingly refractory rock, this being made possible by sinking and raising in 5 sections simultaneously. The steel shaft-rockhouse is 100′ high, with large wings, fitted with steam-hammer and 5 Hodge crushers. The hoist is an Allis-Chalmers Corliss type direct-acting engine of 8,000 h. p., with cylinders 52x84″ and winding drums 28′ in diameter by 11′9″ face, carrying 8,000′ of 1½″ steel cable. The hoist can raise a 6-ton skip from a depth of 1½ miles at a speed of 3,000′ per minute, hoisting being limited to this rate by an automatic cut-off, which also prevents overwinding. Starting a load of 6 tons from a depth of nearly one mile, the hoist, if untouched, will check, after raising the skip a few feet higher than the appointed place in the shafthouse, without damage of any sort. The main shaft carrying the drum weighs 60 tons. The engine house is 58x94′, with 56x92′ boiler house adjoining, both of stone with steel truss roofs. This shaft produces about 1,000 tons daily, or approximately 30% of the total output of the mine.

The stoping ground tributary to No. 4 shaft is nearly exhausted, and as a new hoist would be required for greater depth, and the lower stretches of ground tributary to No. 4 can be easily reached from No. 7 by electric trams, No. 4 will be abandoned. The water heretofore forked from No. 4 will be raised through shafts Nos. 2, 6 and 7, these having 1,300-gallon bailers for the purpose.

Equipment at No. 2 shaft is practically a duplicate of that at No. 7.

No. 6 shaft, only 200′ south of the Franklin line, has an Allis-Chalmers hoist with a drum 22′6″ in diameter, raising 8-ton skips.

No. 8 shaft, on the Mesnard tract, is showing decided improvement in value at depth. The hoist, taken from No. 2 shaft, is good for a depth of 4,000′. No. 8 has a 12-drill Rand air compressor with 17x24″ cylinders, the boilers, hoist and compressor being housed in a single frame building. The shafthouse is similar to those at Nos. 2 and 6 in design and equipment.

Electric underground traction, first employed tentatively in 1901, is now in extensive use throughout the mine. The plant was installed by the General Electric Co. and tram-lines average about 1,800′ each in length, with gradients of 1.5% towards the shafts. The equipment includes 15 electric locomotives, each weighing 5,500 lbs., standing 3′ high by 43″ wide and 9′ long, with draw-bar pull of 700 lbs. on a level track, each hauling 4 or 5 three-ton rock cars at a speed of 6 to 8 miles per hour, one man caring for each train. The underground traction power plant is on the 57th level of No. 2 shaft, having a 100-kw. direct current generator operating the haulage system. Tram-cars are unloaded into 500-ton storage bins, built on the hanging-wall side of the shafts, there being such bins on two levels of No. 2 shaft, 4 levels of No. 6 shaft and 7 levels of No. 7 shaft. This system of storage obviates the loss of time by either the tram-lines or skips and adds at least 25% to the hoisting capacity of the mine.

The mine employs 180 power drills in drifting and stoping. In 1903 diamond drills bored 1705′ of holes, but nothing of special promise was found. The mine is troubled by air-blasts, these being violent disturbances of a nature not thoroughly understood, but presumably caused by the settling of superincumbent rock in the scores of miles of worked-out openings, causing violent compression of the air elsewhere throughout the mine.

The surface plant is exceptionally complete. The 62x145′ machine shop, of stone, brick and steel, with truss roof, is absolutely fire-proof, and has a traveling crane covering the entire shop, and a complete equipment of modern machinery and tools. Adjoining is a 53x69′ compressor-house, of stone and steel, with fire-proof truss roof, housing two 60′-drill cross-compound two-stage condensing right and left hand Corliss air compressors, so connected that air from them is available in any part of the mine, the cross connection eliminating danger of inadequate air supply through disabling of either section. Steam from the compressor plant exhausts into a dam built for the purpose. A plastered brick tunnel connecting boiler house, machine shop and compressor plant serves as a conduit for steam and air pipes. The blacksmith shop is 50x154′, with a 50x90′ wing, of ashlar finished redstone, with fire-proof steel truss roof having 3 large ventilators, equipped with 12 forges, steam-hammers, fan, bolt-cutters, drills, grindstone, etc., and is a model smithy in every respect. Near No. 7 shaft are two boiler-houses, each having eight 100-h. p. Roberts tubular return horizontal boilers. A 56x75′ boiler-house at No. 6 shaft has four 250-h. p. Wickes water-tube vertical boilers and nine 100-h. p. horizontal locomotive firebox boilers. The boiler-house at No. 6 also has a powerful fire pump. The water for boilers and mine location is taken from Portage Lake, the pumping station, on the margin of the lake, being of ashlar finished redstone, the pumps forcing water for one mile against a head of 640′. The coal yard is between shafts 2 and 4. Steam engines have been replaced by electric motors in the carpenter shop, roundhouse and smithy. The mine has a private telephone system with 25 instruments connecting the principal mine and mill buildings, and a 20x25′ frame exchange building. The company owns several hundred dwellings, the newer structures being mostly of 7-room size, on solid stone foundations, the mine location being noted for its neatness. The company also has extensive holdings of valuable land adjoining the city of Hancock, and portions of this ground are platted from time to time, for residence purposes, and sold at good prices.

The Quincy & Torch Lake railroad, 6 miles long, built by the company in 1890, touches all of the shafts and mine buildings at the mine, and at the boiler house, wharves and coal-shed at the mill, and is connected with the Mineral Range, Hancock & Calumet and Copper Range railroads. The road has solid rock ballasting and steel bridges, with a continuous down-grade haul between the mine and the mill. Equipment includes 6 locomotives, freight cars and nearly 150 hopper-cars for rock. All of the newer cars have automatic couplers, air-brakes, and the latest improvements. The roundhouse is near No. 7 shaft and has a 36x40′ addition containing a special machine shop for the use of the railroad.

The mills are at Mason, on Torch Lake. No. 1 mill, of wood, has 5 Allis-Chalmers 2-way stamps with 20″ cylinders, changed to the coarse stamping system, which materially increases the capacity of each head. Dressing machinery includes 92 Hodge jigs and 30 Wilfley tables, and 40 extra roughing jigs and 30 finishing jigs were added in 1903, the latter treating material in combination with Wilfley tables, instead of the latter alone, as heretofore. This mill has a trolley system for handling the mineral and a similar trolley line is to be installed in No. 2 mill, which stands 630′ north of the old mill and is 132x216′ in size, of steel on stone foundations, with 180 windows, each having 13⅛ sq. ft. of glass, flooding the interior with light. This mill has three 20″ Allis-Chalmers cylinders, each stamp having foundations of heavy timbers and concrete, surmounted by a bottom plate of 22 tons, a middle plate of 18 tons and a top plate of 18 tons, all of solid iron castings, above which are the mortar-boxes of the stamps. Finisher jigs and slime-tables have been replaced by 24 Wilfley tables, 8 for each stamp, assisted by 4 Standard concentrators. Each stamp has 12 rough jigs, 6 Wilfleys for finishing and 2 Wilfleys and 1 Standard table for slimes. The boiler house at the new mill is 56x90′, of steel on stone foundations, with four 250-h. p. Wickes vertical water-tube boilers and a 100′ smoke-stack on a 30′ foundation. Stamps have 1″ revolving screens for mortar-boxes and the mill has a settler, from which slimes are taken to the Wilfley tables. The mill also has a Monadnock regrinding mill for raggings. Capacity of the two mills is about 3,400 tons daily.

The 54x54′ brick and steel pumphouse at the mill has a 20,000,000-gallon Allis-Chalmers vertical triple-expansion pump and the old pump house has 3 pumps with a combined capacity of 21,000,000 gallons daily. Water is taken from a 7x7′ 6″ tunnel, driven 100′ under the bed of the lake. A 6x6′ 6″ tunnel 440′ long connects the mills, boiler-houses and pump-houses, this being bricked and plastered inside and carrying both water and steam pipes. The mill has an electric light plant, machine shop and sundry minor buildings, and a considerable village has grown up about the works.

The Quincy has three docks. One is at Hancock, with a 40x416′ wharf and 64x124′ warehouse with deep water in front and railroad tracks behind. A second dock, at the Ripley smelter, has a 350′ shipping wharf for copper and a 250′ coal wharf. The third dock, at the Torch Lake mills, has a 40x400′ wharf built of Washington fir, with 18′ of water alongside. On it stands a 300x300′ coal-shed of steel with corrugated iron siding and roofing, having storage capacity for 80,000 tons of bituminous coal, this being about the annual consumption of the mine and mills. There are three coal-hoists, these being 120′ steel towers traveling on a track, 22′ wide and 300′ long, that runs the entire length of the shed. The coal-hoists are operated by steam power and can unload 100 tons each per hour. The plant was built by the American Bridge Co. at a cost of about $200,000, and effects a saving of about 12 cents per ton on all coal used by the company. The railroad reaches the shed by a 650′ trestle, partly of timber and partly with steel bents, supported on 240 concrete piers.

The Quincy smelter, at Ripley, opposite Houghton, was blown in Dec. 1, 1898. All principal buildings are of ashlar finished redstone. The 84x144′ main building has four 40-ton reverberatory furnaces with 75′ stacks. Other structures are the cupola building, engine-house, casting-house, coal-shed, cooper shop and a 50x100′ frame warehouse. The smelter is estimated to save the Quincy about $100,000 yearly. A trolley dipping system and a trolley system for handling large bars and cakes were installed in 1903, and mineral is to be transported from mills to the smelter in hopper-cars, instead of in barrels as formerly.

Production in 1903 was 18,598,288 lbs. of refined copper, from 25,220,220 lbs. of mineral, giving a percentage of 73.3% refined copper in the mineral, of which 4,060,435 lbs. was heavy copper from the rockhouses and 21,159,785 lbs. was mineral from the mills. The production of refined copper was 19.3 lbs. per ton of rock stamped. Production for 1904 should be about the same as in 1903.

The wisdom of the exceptionally heavy outlays for improvements made during the past 6 or 7 years is fully justified by the outcome. But for the betterments then made the Quincy would now be in a bad way, but by reason of these improvements the mine is earning very large dividends. In 1889 the mine was crushing about 480 tons daily and 15 years later is treating an an average of 3,400 tons per diem. The Quincy holds the record for the cheapest copper ever made by any Lake Superior mine, the cost having been only 5.7 cent per lb. in 1894. The mine is managed with a careful eye to economy, but expenditures are not stinted for needed improvements.

QUINCY MINING CO. **UTAH**

Property of Quincy Mining Co., of Utah, sold 1902, to Daly-West.

QUINCY & ARIZONA DEVELOPMENT CO. **ARIZONA.**

Office: care of E. L. Wright, secretary and treasurer, Hancock, Mich. Mine office: Bisbee, Cochise Co., Ariz. J. J. Beatty, president; Geo. Keller, superintendent. Capitalization $600,000, shares $10 par. Lands, 12 claims, adjoining the Portage Lake & Bisbee.

QUINTERA MINING CO., LTD. **MEXICO.**

Offices: 18, Bishopsgate St., London, E. C., Eng., and 2, Square de l'Opera, Paris, France. Mine office: Alamos, Sonora, Mex. J. Kulp, chairman; J. G. Mills, secretary; E. Renaud, manager. Capital, £52,000. Pays annual dividends of 2s. to 5s. Its primarily a silver mine, making lead and copper as by-products. Main shaft is 1,100′. Has steam and electric power, 20-stamp mill, 20-ton leaching plant, 25-ton concentrator and 35-ton smelter, employing several hundred men. Production for 1902 was 184 metric tons of argentiferous lead-copper matte, probably equivalent to about 50 tons of refined copper.

RADLEY & SHAW CLAIMS. **BRITISH COLUMBIA.**

Lands, 7 patented claims, area 268 acres, at Brown's Bay, Discovery Passage, Vancouver Island, B. C., with 4 ore bodies, opened by tunnels of 35′, 122′ and 256′, showing bornite giving average assays of 8% copper, 2 oz. silver and $3 gold per ton.

RAMBLER COPPER MINING CO. **ARIZONA.**

Office: 110 South Broadway, Los Angeles, Cal. Mine office: Stoddard, Yavapai Co., Ariz. Henry Reifsneider, superintendent. Capitalization $500,000, shares $1 par. Lands, 7 claims, area 140 acres, showing ores assaying 12% to 42% copper. Has gasoline power.

RAMBLER COPPER MINING CO. **WYOMING.**

Property transferred, Oct. 1, 1902, to Rambler Mining & Smelting Co.

RAMBLER MINING CO. **WYOMING.**

Office and mine: Rambler, Carbon Co., Wyo. Idle. S. H. Potter, president; Aaron Slothower, treasurer and general manager; L. S. Niece, secretary. Organized under laws of Wyoming, with capitalization $2,000,000, shares $1 par. Lands, 9 claims, area 160 acres, in the Battle Lake district, showing veins occurring as fissures in diabase schists and as contacts between diabase and quartzite, veins ranging 1′ to 6′ in width, and giving assays up to 25% copper and $1 to $10 gold per ton, from oxide, carbonate and sulphide ores. Development is by a 100′ main shaft and a 550′ crosscut tunnel, work on which is to be resumed in 1904.

RAMBLER MINING & SMELTING CO. **WYOMING.**

Office: Laramie, Wyo. Mine office: Holmes, Albany Co., Wyo. Employs about 40 men. Organized October, 1902, under laws of Wyoming, with capitalization $2,000,000, shares $1 par. Frank M. Wooton, president; Avery T. Holmes, vice-president; Milton M. Green, secretary; Wm. H. Webber, superintendent; Edw. E. Chose, consulting engineer. Lands, 10 claims, area 200 acres, at head of Douglass Creek, in the Medicine Bow Range, 9,500′ above sea-level and well timbered with spruce and pine.

Mine was opened for gold in 1870 by a 40′ shaft, and was relocated for copper in 1900. Country rock is dioritic granite, no sedimentary beds being found in the neighborhood, and ore body is apparently a fault fissure in granite. Mine is opened by a 65′ vertical shaft from bottom of which an incline runs on the vein at an angle of 45°, with three levels opened. The vertical main working shaft, 175′ deep, is connected with the original workings on the second level at 95′ and at the third level at 128′. There are shaft-houses at both shafts, the working shaft having a cage and 35-h. p. friction hoist. The mine has about 1,000′ of underground openings, and is claimed to have 22,100 tons of ore, ranging from 20% to 45% copper, blocked out for stopping, on the first and second levels. Exact size of the ore body is undetermined, but ore gives assays ranging from 6% to 39% copper, with average returns of about 33% copper from carefully hand-selected ore shipped in 1902. Ore has a gangue of decomposed granite, giving talcose alteration products and carrying more or less pyrite, hematite and marcasite, all useful fluxes and all carrying small percentages of copper. The gangue is easily separable, if concentration should be desired on the low-grade ores.

The Rambler carries a great variety of copper minerals, in various stages of alteration and associated with sundry rare metals in commercial quantities, but comparatively free from such deleterious elements as antimony, bismuth and arsenic. The vein carries a little native copper associated with cuprite, in the upper levels, and also gives melaconite, chrysocolla, chalcocite, covellite and chalcopyrite, and is especially notable for containing large quantities of covellite which carries gold, iridium, osmium, palladium and platinum, the latter occurring as sperrylite, the only known occurrences of platinum with copper being in Wyoming. Assays of Rambler matte have given returns as follows, per ton of blister copper: 6.75 oz. silver, 2.25 oz. gold and platinum, and 6 oz. palladium. The value of the palladium is contingent upon finding a market for this rare metal at $10 per ounce, in considerable quantities. Cost of refining the matte and separating the various rare metals is approximately $40 per ton, or 2 cents per lb. of blister copper.

Surface improvements include a 21x44′ shafthouse, ore bins connected with shafthouse and smelter by trestle, carpenter shop, smithy, office, assay office, sawmill, boarding house and bunk-houses, also a 40-ton smelter, with water jacket-blast furnace, which makes matte, when in operation. Ores are self-fluxing. Production in 1903 was 249,196 lbs. of refined copper.

RAMBLER EXTENSION MINE. **WYOMING.**

Includes the Big Nell and sundry adjoining claims, in Albany county, Wyoming.

RAMMELSBERG MINE. **GERMANY.**

Office and mines: care of Königliches Oberbergamt, Clausthal im Harz, Germany. Property is owned jointly by the Prussian crown and the Herzogthum of Brunswick, and ore is smelted at the Preussische-Braunschweig-'sche Gemeinschaftswerke, Unter Harz, Germany. The ore occurs as a great lenticular mass, 50′ wide and about 3,500′ long, in schists intercalated in Devonian slates, being iron pyrites carrying chalcopyrite, tetrahedrite, galena and sphalerite. The smelting company has four plants, and also smelts cupriferous lead and zinc ores from the Oberharz, making about 3,000,000 lbs. of refined copper yearly.

MINA DE RAMOS. **MEXICO.**

Office: care of D. E. Murphy, lessee, Aguascalientes, Mex. Mine office: Ramos, San Luis Potosi, Mex. Francis H. Sisterman, general manager. Is a producer of silver and copper. Main tunnel, 1,000′. Has steam and gasoline power and concentrator, employing several hundred men.

JOSE TOMAS RAMOS. **CHILE.**

Owns the Chalinga mine, in the department of Illapel, Chile. Idle.

RAMSDELL-PARROT MINE. **MONTANA.**

At Butte, Silver Bow Co., Mont. Is connected on 400′ and 500′ levels with the Colusa-Parrot mine.

RANSON COPPER MINING COMPANY OF ONTARIO, LTD. **ONTARIO.**

Office: Sault Ste Marie, Mich. Organized 1902, under laws of Ontario, with capitalization $3,000,000, shares $1 par. B. Frank, president; David Rustander, secretary; D. J. Ranson, superintendent; R. H. Taylor, consulting engineer; John C. Byrne, mining captain. Lands, 3,600 acres, in Chesley and Anderson twps., Algoma, Ontario, showing 14 veins, of which 6 contact veins are being prospected, these having average widths of 25′ and giving assay values of 12% copper and 3 oz. silver per ton, from chalcopyrite. Has steam power and 8 shafts, of 23′ to 75′. Apparently idle.

RARITAN COPPER WORKS. **NEW JERSEY.**

Works office: Perth Amboy, N. J. Is owned and operated by the United Metals Selling Co. Plant, completed in 1899, is one of the largest and most modern in the world, doing an immense business in electrolytically refining blister copper from the subsidiary properties of the Amalgamated Copper Co., and from many independent mines in the United States, Canada and Mexico.

RARUS MINE. **MONTANA.**

At Butte, Silver Bow Co., Mont. Is the subject of numerous lawsuits between the subsidiary companies of the Amalgamated and United Copper companies. Employs several hundred men when fully worked, but is frequently idle, owing to the litigation that is the curse of Montana mining. Vein is upwards of 300′ wide in places.

RAVEN MINING CO. **MONTANA.**

Mine office: Butte, Silver Bow Co., Mont. Organized 1903. Property is the Raven mine, showing a 125′ barren capping. Main shaft was 530′ deep at close of 1903, and is to be sunk to depth of 1,000′, in expectation of developing copper ores at depth.

RAWLEY MINING CO. **COLORADO.**

Mine office: Bonanza, Saguache Co., Colo. David G. Weems, manager. Ores carry lead, silver and copper. Has steam and electric power.

RAY COPPER MINES, LTD. **ARIZONA.**

Offices: 1, Gresham Bldgs., London, E. C., Eng. Mine office: Ray, Pinal Co., Ariz. Property in hands of a receiver, owing to bad management and litigation. Lands, 1,296 acres, on Mineral Creek, Pinal county. Mine is opened by shafts and tunnels and has steam and gasoline power, with a 250-ton concentrator and 6-mile narrow gauge ralroad. Is estimated to have nearly 1,000,000 tons of 4.5% copper ore in sight. Property is valuable, and with reorganization or sale should make a good mine.

READY PAY MINING CO. **NEW MEXICO.**

Mine office: Hillsboro, Sierra Co., N. M. Ores carry gold, silver and copper.

REALTY SYNDICATE. **CALIFORNIA.**

Offices: 101 Sansome St., San Francisco, Cal. Mine office: Mills College, Alameda Co., Cal. F. M. Smith, superintendent. Employs 34 men, at the Leona Heights mine, in the outskirts of Oakland. Ore is cupriferous iron pyrites carrying 1% to 2% copper and rich in sulphur. Had produced about 12,000 tons of ore to close of 1903.

REBECCA COPPER MINING CO.

Office: 542 The Rookery, Spokane, Wash.

MINA LA RECOMPENSA. **MEXICO.**

Mine office: Santa Maria Dolores, Durango, Mex. P. J. Opperman, superintendent. Ores carry gold, copper and zinc. Has steam and water power, and a 10-stamp mill, employing about 60 men.

RED BIRD MINING CO. **MONTANA.**

Office: Helena, Mont. Mine office: Austin, Lewis & Clarke Co., Mont. Employs 32 men. Organized August 18, 1902, under laws of Montana, with capitalization $1,500,000, shares $5 par. Has paid dividends of $42,000, of which $39,000 was paid in 1903. Ended 1903 with $16,092.24 cash on hand and without accrued liabilities. S. J. Punches, president, treasurer and general manager; R. A. Punches, vice-president; J. M. Clements, secretary. Lands, 4 claims, area 180 acres, in the Greenhorn district, showing country rocks of granite and limestone, carrying 15 fissure veins, of which 6 of 5′ average width are being developed, these giving estimated average values of 21% copper, 45% lead, 35 oz. silver and $5 gold per ton, from oxide and sulphide ores. Property also shows a 42% iron ore body. Mine is developed by shafts of 200′, 350′ and 400′; with about 2,000′ of underground openings. A 600′ vertical shaft is to be completed about May, 1904. Company has also taken a bond and lease on a property adjoining the Red Bird, on which a 160′ vertical shaft shows a 10′ vein carrying 7% copper ore. Has steam power and ships ore to the Helena smelter. A spur from the Northern Pacific railroad will permit loading of ore direct from mine into cars.

RED CLOUD MINE. **MONTANA.**

Office and mine: Garnet, Granite Co., Mont. Dr. Peter Mussigbrod, superintendent. Ores carry gold, silver, copper and lead. Has a 10-stamp mill and steam power, employing about 40 men.

RED CLOUD MINING CO. **CALIFORNIA.**

Office: Los Angeles, Cal. Mine office: Salton, Riverside Co., Cal. E. H. Gould, superintendent. Ores carry gold, silver, copper and lead. Has steam and gasoline power, 2-stamp mill, concentrator and 80-ton smelter, employing about 50 men.

RED FOX MINING CO. **BRITISH COLUMBIA.**

Mine office: McGuigan, Yale & Cariboo district, B. C. Has cupriferous and argentiferous lead ores.

RED JACKET & BISBEE DEVELOPMENT CO. **ARIZONA.**

Office: 10 Quello Blk., Calumet, Mich. Mine office: Bisbee, Cochise Co., Ariz. Employs 12 men. Edw. Ryan, president; Frank Hahn, vice-president; John B. Curtis, secretary; Edw. F. Cuddihy, treasurer. Directors are preceding officers, Michael J. Cunningham, John Nester, Thos. M. Lyon, Edw. Ulseth and John D. Cuddihy. H. S. Hunt, superintendent. Organized June 5, 1903, under laws of Arizona, with capitalization $500,000, shares $10 par; issued, $80,000. Lands, 13 claims, area 220 acres, in the Warren district. Is developing by a 3-compartment shaft, 125′ deep at close of 1903.

RED ROCK COPPER CO. **ARIZONA.**

Mine office: Tucson, Pima, Co., Ariz. J. C. Perry, agent. Idle.

RED STAR MINING CO. **WASHINGTON.**

Mine office: Kalama, Cowlitz Co., Wash. Ores carry gold, cinnabar and copper.

RED WING MINING & MILLING CO. **UTAH.**

Mine office: Bingham Canyon, Salt Lake Co., Utah. E. W. McGarrick, superintendent. Has auriferous and cupriferous silver-lead ores.

RED WING EXTENSION MINING CO. **UTAH.**

Office: care of E. McGarrick, president, Salt Lake City, Utah. Mine office: Bingham Canyon, Salt Lake Co., Utah. Capitalization $125,000, shares 25c. par. Lands, 120 acres, adjoining the Red Wing mine, showing a 4′ vein giving average assays of about 0.5% copper, 7% lead and 8.5 oz. silver per ton, with about 60,000 tons of ore in sight.

REDDING GOLD & COPPER MINING CO. **CALIFORNIA.**

Office: 22 California Safe Deposit Bldg., San Francisco, Cal. Mine office: Redding, Shasta Co., Cal. A. A. Watkins, president; C. W. Crumb, superintendent. Lands, 25 claims, including the Bedford group north of Keswick, the Stabler group north of Centreville, and the Sky Blue group at the mouth of Middle Creek. Ores carry gold, silver and copper. Has steam power. Understood to be negotiating for British capital.

REDEMPTION MINE. **ARIZONA.**

Office and mine: care of R. J. Ferguson & Sons, owners, Chloride, Mohave Co., Ariz. Ores are auriferous and argentiferous copper oxides.

REDWOOD COPPER QUEEN MINING CO. **CALIFORNIA.**

Office: San Francisco, Cal. W. P. Ferguson, president; Thos. Mellersh, secretary and treasurer. Lands, 840 acres, patented, 35 miles southeast of

Ukiah, Mendocino county, California, developed by tunnels and winzes. Vein, much broken by faults prominent on surface, has a 2′ to 4′ gossan capping traceable for a mile. Country rocks are brecciated porphyry and sandstone, and ores include azurite, malchaite, cuprite, melaconite, tetrahedrite and chalcopyrite.

REED GOLD & COPPER MINING CO. **VIRGINIA.**

Letter returned unclaimed from Norfolk, Va.

REFORMA MINING CO. **MEXICO.**

Letter returned unclaimed from Fuerte, Sinoloa, Mexico.

MINA REINA DE COBRE. **MEXICO.**

Mine office: Alamos, Sonora, Mex. Alfredo R. Cano y Ca., owners: Juan G. Cano, manager. Ores carry gold, silver and copper. Employs 40 men.

COMPANIA REINA DE COBRE. **MEXICO.**

Mine office: Ejutla, Oaxaca, Mex. Capitalization $100,000, Mexican. Jas. Butler, general manager; Juan de Peza, superintendent. Property is the Luna de Oaxaca mine.

COMPANIA MINERA LA REINA. **MEXICO.**

Mine office: Cusihuiriachic, Chihuahua, Mex. Ramon Navarro, president and manager. Ores carry silver, lead, gold and copper. Has gasoline power and three Huntington mills, employing about 150 men.

REINDEER MINING CO. **IDAHO.**

Office and mine: care of A. M. Strode, president and manager, Mullan, Shoshone Co., Idaho. Said to have a 2′ vein of 20% ore, and 3′ to 6′ of concentrating ore.

REINS COPPER CO. **MONTANA.**

Office and mine: Butte, Silver Bow Co., Mont. Employs 25 men. Organized April 27, 1903, under laws of Montana, with capitalization $1,500,000, shares $1.50 par. John P. Reins, president; W. W. McDowell, secretary; E. J. Trerise, superintendent; G. L. Thompson, purchasing agent. Lands, one claim, area 18 acres, in the Summit Valley district of Silver Bow county, including the Combination mine, which has been tied up since 1881 by litigation. Mine is opened by a 550′ shaft and equipped with a 240-h. p. steam plant, including a hoist good for 900′ and a 5-drill air compressor. Property has the extension of the Leonard lode and adjoins the celebrated Minnie Healy mine. Company is composed of strong men and property, though small, is regarded as very promising.

RELIANCE GOLD MINING CO. **ARIZONA.**

Mine office: Groom Creek, Yavapai Co., Ariz. L. A. Davies, superintendent. Has steam power and 10-stamp mill.

REPUBLIC CONSOLIDATED MINING & MILLING CO. **COLORADO.**

Mine office: Idaho Springs, Clear Creek Co., Colo. Thos. B. Crow, superintendent. Ores carry gold, silver, lead and copper. Has steam power and employs 20 men.

REPUBLIC SMELTING CO. **COLORADO.**

Office and mines: Leadville, Lake Co., Colo. Capitalization $500,000.

Has bought the Boston Gold-Copper Company's smelter, with three furnaces of 500 tons daily capacity, and is remodeling the plant.

RESCUE COPPER CO. **ARIZONA.**

Office: 417 Security Bldg., St. Louis, Mo. Mine office: Ajo, Pima Co., Ariz. A. J. Shotwell, president. Property, which is idle, is regarded as a fair prospect.

RESOLUTE COPPER CO. **MICHIGAN.**

Office: care of John F. Carey, president, Escanaba, Mich. Lands, 1,120 acres, in sections 7-18-19, 58-29, Keweenaw county, Michigan. Organized 1899, under laws of Michigan, with paid-up capital $25,000, shares $25 par. John D. Cuddihy, Calumet, Mich., vice-president; A. F. Heidkamp, Lake Linden, Mich., secretary; J. L. Nankervis, Calumet, Mich., treasurer. Main shaft, 379′, with about 2,000′ of drifts. Idle many years.

MINA RESTAURADORA. **ARGENTINA.**

Mine office: Cerro de Capillitas, Tucuman, Argentina. Opened circa 1850, and has been one of the principal mines of Argentina. Has a great variety of high-grade ores, but was idle at last accounts, owing to lack of proper transportation facilities.

MINA LA REVANCHA. **MEXICO.**

Mine office: Ojocaliente, Zacatecas, Mex. J. Incarnacion Spina, owner; R. Spina, manager.. Ores carry silver, lead and copper. Has steam power and Chilean mill, employing about 50 men.

REVENUE MINING CO. **WASHINGTON.**

Office: 201 Northwestern Bldg., Minneapolis, Minn. Frank E. Plummer, president; Edwin Perry, vice-president; D. A. Simmons, secretary; Sterling Cross, treasurer. Organized 1901, under laws of Arizona, with capitalization $1,250,000, shares $1 par. Lands include the Revenue group of 140 acres, showing copper-gold ores, in Stevens county, Washington; oil lands in Utah; zinc and slate lands in Arkansas, and a gas franchise for the town of Belton, Missouri.

REVENUE MINING & MILLING CO.

Office: care of F. D. Russel, Denver, Colo.

REWARD MINE. **CALIFORNIA.**

In Plumas county, California. Formerly known as the Cosmopolitan, a producer, circa 1863, but idle many years. Opened by tunnels and shaft.

REWARD COPPER MINING CO. **ARIZONA.**

Mine office: Vekol, Pinal Co., Ariz. Has auriferous copper ores, with steam plant, 20-stamp mill and 20-ton cyanide plant.

REX COBRE MINE. **ARIZONA.**

In the Lone Star district of Graham county, Arizona. W. D. French, superintendent. Has a 200′ two-compartment shaft.

REX GOLD MINES & INVESTMENT CO. **COLORADO.**

Mine office: Leadville, Lake Co., Colo. Jesse F. McDonald, manager. Operates the Rattler and Reconstruction mines, producing gold, silver, lead and copper. Has steam power and employs 20 men.

COMPANIA MINERA LOS REYES. **MEXICO.**

Mine office: Zitacuaro, Michoacan, Mex. Rafael Rodriguez Gil, manager. Is developing a copper ore body by tunnel, with about 100 men.

REYNOLDS MINE. **VERMONT.**

Near the Elizabeth mine, at South Strafford, Orange Co., Vt.

RHODE ISLAND COPPER CO. **MICHIGAN.**

Office: 45 Broadway, New York. Mine office: Calumet, Houghton Co., Mich., Employs about 30 men. Organized 1899, under laws of Michigan, with capitalization $2,500,000, shares $25 par. Wm. R. Todd, president; W. A. O. Paul, secretary and treasurer; Thos. Dennis, superintendent; W. R. Todd, Isaac H. Meserve, Henry A. Wyman, C. J. Devereaux, John Baker and Jas. S. Dunstan, directors. Lands, 800 acres, north of the Franklin Junior.

Official returns to the state of Michigan, as of date Jan. 1, 1903, disclose the following figures:

Amount cash paid in on capital stock	$600,000.00
Amount paid in by conveyance of property to company	300,000.00
Entire amount invested in real estate	300,000.00
Amount of personal estate	80,543.16
Amount of unsecured or floating debt	2,439.65
Amount due corporation	15,626.00

Expenditures for 1903 were $23,987.79, leaving a balance of $70,076.94 in cash resources, inclusive of $3,253 in unpaid assessments.

No. 7 shaft, 275′ north of the Franklin Junior boundary, is 8x18′, with 3 compartments and is 500′ deep, sunk on the Pewabic amygdaloid, which is 8′ to 10′ wide, with 2′ to 3′ near the hanging wall well mineralized, at points. This shaft, abandoned in 1902, is filled to the first level, on which it connects with No. 2 shaft, 1,200′ to the northward, also 8x18′ and 1,000′ deep, with a frame shafthouse and Nordberg hoist capable of raising 2-ton skips from 1,000′ depth. A crosscut, driven 180′ east, encountered the Allouez conglomerate in March, 1903, and drifting on that lode has been in progress since. This conglomerate is the most encouraging of anything yet opened on the Rhode Island property, and in addition to drifts has a 94′ winze, to be deepened to 150′. No. 2 shaft has crosscuts both east and west. The east crosscut, on the eighth level, at a depth of 1,000′, cut two apparently valueless amygdaloids, one being the Mesnard epidote. The East lode, about 5′ wide, carries a little copper, but nothing especially encouraging. The West lode, 96′ from the shaft and 7′ to 9′ wide, carries considerable copper in bunches. The four amygdaloids lying between the West lode and the Allouez conglomerate have been tested by drifting north and south, three proving barren.

Surface improvements include a 30x60′ machine and blacksmith shop, a 30x50′ frame warehouse and supply office and 15 dwellings. No. 2 engine house has a 12-drill Rand compressor, operating 2 power drills.

RHODESIA COPPER CO., LTD. **RHODESIA.**

Offices: Salisbury House, London, E. C., Eng. Lord Gifford, chairman; Tom Donald, secretary; T. G. Davey, consulting engineer; Bechuanaland Exploration Co., Ltd., manager in South Africa. Capital, nominal, £750,000; issued, £500,000. Lands, 60,000 acres in farms, 400 square miles of miscellaneous lands and rights to locate 150,000 acres of farming land and 2,000 mining claims in northern Rhodesia. Company has located 290 claims on ancient copper workings. The Broken Hill mine has been opened by trenches and a tunnel, showing a 154′ body of high-grade zinc ore. The Kitakata mine, one-half mile northeast of the Broken Hill, shows stains and hand-specimens of copper oxides and carbonates, and is to be opened by a shaft. Old copper workings were discovered in 1903, near the Bwana M'kubu, on which 20 claims, called the Stembock, are located.

RICHARD III. DEVELOPMENT CO., LTD. BRITISH COLUMBIA.

Office: Duncans, B. C. Mine office: Mt. Sicker, B. C. Has a partly developed claim near the Tyee mine.

RICHFIELD MINING & MILLING CO. MEXICO.

Offices: Washington, D. C., and Nogales, Ariz. Mine office: Tuarpe, Sonora, Mex. Arthur Harper, superintendent. Is developing the Dos Naciones and other claims, showing silver, lead and copper ores. Main shaft, 150′.

RICHMOND GROUP GOLD MINES CO. NEW MEXICO.

Office: Board of Trade Bldg., Boston, Mass. Mine office: Hillsboro, Sierra Co., N. M. E. F. Pearson, superintendent. Ores carry gold and copper. Has steam power and employs 10 men.

RICHMOND & MONITOR MINES. MONTANA.

Mine office: Saltese, Missoula Co., Mont. Chas. J. Heidenreich, manager. Have secured considerable development, showing ores carrying native copper freely and assaying up to $60 per ton.

RIGBY REDUCTION CO. ARIZONA.

Works office: Mayer, Yavapai., Ariz. T. Johns Rigby, president; H. A. Clark, superintendent.

RINCON MINING CO. ARIZONA.

Office: care of B. J. O'Reilly, secretary, Naco, Ariz. Organized under laws of Arizona, with capitalization $2,500,000, shares $25 par. Lands, 27 claims, 22 miles north of Benson, Cochise county Arizona, developed by a 130′ tunnel showing ore giving assays up to 23% copper.

RINGING ROCKS COPPER MINING CO. PENNSYLVANIA.

Mine office: Pottstown, Montgomery Co., Pa.

RIO ARRIBA CONSOLIDATED MINES CO. NEW MEXICO.

Letter returned unclaimed from former office, Milwaukee, Wis. Had claims near Tres Piedras, Taos county, New Mexico.

MINES DE CUIVRE ET DE PLOMB DE RIO FARDIS. SPAIN.

Organized August, 1903, with capitalization 2,500,000 francs, shares 250f. par, to develop copper-silver-lead properties near Molinillo, Ciudad Real, Spain.

COMPANIA MINERA RIO GRANDE Y MEXICO.
DOLORES, DE LONDRES.

Offices: 37, Old Jewry, London, E. C. Eng. Mine office: Guadalupe, Guerrero, Mex. A. R. MacSwinney, manager. Operates La Nave mine, producing silver and copper. Has steam and water power, concentrator and leaching plant, employing about 40 men.

RIO GRIO DISTRICT COPPER CO., LTD. **SPAIN.**

Offices: 12, Lime St., London, Eng. Registered October 30, 1903, with capitalization £120,000, to acquire and work mining properties in the province of Zaragoza, Spain.

RIO HONDO COPPER CO. **NEW MEXICO.**

Sold to San Cristobal Copper Co.

RIO LUNA MINES CO., LTD. **SPAIN.**

Mine office: Campo La Lomba, Leon, Spain. Offices supposed to be in Nottingham, England.

RIO TENIDO COPPER MINES, LTD. **SPAIN.**

Offices: 19-21, Queen Victoria St., London, E. C., Eng. A. H. Greenhill, secretary; Louis Barre, mine manager. Capital, nominal, £150,000; issued, £111,855. Lands, sundry mines between the Rio Tinto and Tharsis, in the province of Huelva, Spain.

RIO TINTO MINE. **BRITISH COLUMBIA.**

A prospect at Beasley camp, 7 miles west of Nelson, B. C., said to show sulphide ores assaying $10 per ton.

RIO TINTO CO., LTD. **SPAIN.**

Offices: 30, St. Swithin's Lane, London, E. C., Eng. Spanish general office: Huelva, Spain. Mine office: Nerva, Huelva, Spain. Employs 11,000 men. J. J. J. Keswick, chairman; Maj.-Gen. Sir Arthur E. A. Ellis, Chas. Wm. Fielding, Lionel C. G. Sartoris, John MacFarlan, John M. McDonald, directors; Alfred Charles de Rothschild and John M. McDonald, trustees for mortgage bondholders; Turquand, Youngs & Co., auditors; Commercial Bank of Scotland, Ltd., bankers; W. A. Carlyle, mine manager; J. Gordon McLeod and Saml. J. Bowes, joint secretaries; R. E. Palmer, assistant manager; Gordon Douglass, engineer.

Registered Mar. 29, 1873, with capital £3,250,000, half in cumulative £5 preference and half in ordinary £5 shares. Warrants to bearer are issued in denominations of 1, 5, 10, and 25 shares; Debentures, £3,241,640, at 4%, redeemable at any time after June 30, 1905, on 28 days' notice. Gross profits for 1901 were £1,811,419 and net surplus was £1,366,876, with dividend payments of £1,254,805. Dividends for 1902 were £888,756 10s. 2d., and for 1903 were £1,056,250.

Lands, about 16,000 acres freehold, some 60 miles inland from Huelva, 1,922 hectareas being denominated strictly mining lands, the principal mining operations of the company being in an area of approximately two square miles.

The Rio Tinto mines were worked by the Phoenicians, Carthaginians, Romans and Moors, in ancient days. The mines were worked spasmodically by the Spanish government during the Nineteenth Century, until taken over by the present company in 1873. Prof. J. H. L. Vogt estimates that the ancient miners extracted no less than 20,000,000 to 30,000,000 tons of ore from these mines. Lying above slag-piles left by the Phoenicians is a 10′ bed of alluvium, on top of which are the Carthago-Roman slags. The smelting practice of the Romans apparently was very good, the slags left by them being as clean as those produced today. It is possible, however, that some of the copper left in the old slags has been leached out, during some 2,000 years of partial exposure to the elements. There are many remains of old machinery, especially sheave-wheels, shafts, etc., evidently used as parts of hoisting machinery. These relics of by-gone mining work are invariably of oak, and if iron was ever used for such purposes, it turned to rust long centuries ago. There are also many potsherds, including miners' lamps of classic pattern, and Roman coins are frequently found. The Roman system of mining apparently was to cut narrow seams and slab off the ore in large masses, either by quicklime tamped into the crevices and wetted, or by wedging, and probably by the use of both methods, which were those in general vogue previous to the introduction of gunpowder for blasting.

The Rio Tinto mines are in the Sierra Morena range, and the topography of the district is quite rugged. Ore bodies occur as mammoth lenses, with slate and clay walls on porphyry, and are surmounted by immense gossan cappings, considerably decomposed and quite easily broken for removal. The surface ore has been leached to the point of absolute worthlessness, the zone of secondary enrichment beginning at a depth of approximately 100′, and continuing down to about 300′. The mine has 4 veins, or series of lenses, known as the North, Middle, South and Valley, with mines opened on each, two of the mines being worked open-cast and two by regular underground stopes. The underground mines are worked pillar-and-stall, with levels every 12½ metres, levels being opened 4 metres high, and the entire floor divided into galleries and crosscuts of 4x4 metres, leaving pillars of 6x6 metres, which seems a rather ineffective method. The deepest shaft, nearly 1,200′, is in the San Dionisio mine, on the Middle vein. The principal workings are open-cast, where the capping is sliced down in terraces, and the ore mined in terraces also, cars being brought in by locomotives to as great a depth as practicable, both in stripping and quarrying. The possibility of using the caving system for underground mining has been considered. The principal drawback to underground mining is the scarcity and high price of wood for timbering, and the extensive use of wood would be obviated were the caving system employed. Diamond drill borings show untouched ore bodies of upwards of 130,000,000 gross tons, giving sufficient reserves for nearly 70 years production at present rate of mining. Stripping operations in 1902 included the removal of 401,334 cubic metres of overburden on the North lode; 560,118 cu. m. on the South lode; 175,237 cu. m. on the Lago lode, and 171,459 cu. m. on the Dehesa lode.

The ores carry an average of 1.5 oz. silver per ton, with traces of gold, and considerable silver is saved by the Claudet process at the smelter. The ores are rich in sulphur and are assorted into three classes, of which the smelting ore carries approximately 6% copper, the export ore about 3.5% copper and 45% to 50% sulphur, and the leaching ore 1.75% to 2% copper. The average percentage of copper carried by the ores treated has ranged from

1.5% in 1876, the first year of production, to 3.234% in 1884, the average of copper extraction in 1902 being 2.342%. About half of the ore produced is smelted, balance being leached or sent abroad to burners. The ores average 4% to 5% copper in the zone of secondary enrichment, and gradually decline in value with depth, until at about 1,000′ the average is only about 1.25%. The ore bodies carry chalcopyrite, sparingly disseminated in solid iron pyrites rich in sulphur. Reserve heaps at the mine were estimated in March, 1903, to contain 142,951 long tons of fine copper. Production of the mine in 1902 was 34,478 long tons of refined copper, from 1,865,289 long tons of ore, of which 627,967 tons were shipped and 1,237,322 tons were treated locally. The copper output of the mine has shown practically no change since 1898. Owing to their richness in sulphur, the shipping ores of the Rio Tinto are in good demand, and in addition to supplying various British works are exported to Germany, France, Belgium and sundry seaboard acid works of the United States. The bulk of the medium-grade ore is shipped to works at Cwm Avon, Wales, where it is burned for sulphur, and the cinder treated by the Henderson wet process for the extraction of copper. Production of the mine is divided into approximately 60% of blister copper, from smelting ores, and 40% of copper secured from the residue of ores shipped to various sulphur burners.

Owing to the system of mining and reduction followed by the Rio Tinto, the mechanical equipment of the mine is not especially extensive, and there are none of the immense hoists and powerful machinery found at the other leading copper mines of the world. This is not due to lack of enterprise, but to the fortunate fact that much of the production is won open-cast, while the underground workings are neither deep nor extensive. The methods of lixiviation followed by the Rio Tinto are explained at length in the chapter on metallurgy. In addition to the amount of copper estimated to be carried in the teleras, or leach-heaps, there are upwards of 100,000 long tons of copper in the tereros, or waste-heaps. Owing to the alteration of heavy rainfalls with protracted seasons of drought, water storage is necessary, large dams having been constructed for that purpose. The ore leached at the mines is no longer calcined, the copper becoming soluble by natural weathering, assisted by systematic sprinkling, and scrap-iron formerly used for precipitation has been superseded by pig-iron from Bilbao. About 7,000,000 gallons of leach-water, strongly charged with copper in solution, are treated daily in the lixiviation plant.

The smelting plant at the mine was blown in January, 1902. The smelter has two 42x160″ elliptical water-jacket cupolas, 23′4″ over all in height, with charging doors 10′ above the bottoms, which are detachable and mounted on wheels. Each furnace has 8 water jackets and 2 charging doors, ore and fuel being charged alternately. The furnaces discharge continuously into settlers, 12′ in diameter and 40″ high, of 30 tons capacity, which have continuous slag discharge. The matte, running 29% to 34% in tenor, is taken to converters in 8-ton ladles by electric traveling cranes. The bessemerizing plant has 6 stands of converters, shells being of the horizontal barrel type, 80″ in diameter and 120″, long with 12 tuyeres and spherical valves.

Converters are rotated hydraulically from an elevated stand. Th
in two parts, for convenience in lining, and are double-lined with a 4"
course of fire-brick, rarely replaced, and an inner section, 22" to
of ground silica and low-grade quartzose copper ores, with 10%
binder. When newly lined the shells have a capacity of only 3 to
increasing to about 8 tons when the inner linings are nearly
Product is shipped as converter bars of 98% to 99% in tenor. Th
also has extensive acid works and smelters at Cwm Avon, Wales. T
& Rio Tinto railway, owned by the company, runs 60 miles from
at Nerva, to the port of Huelva, where the company has extensiv
and terminals, this being the largest private port in the world,
unloading 30 to 40 ocean steamers monthly. The railroad does
freight and passenger business, in addition to transporting ore and
returned profits of £14,694 in 1901. The company owns the
Hugo, of 1,249 tons registered burden, plying between Spain and

The Rio Tinto employs nearly 11,000 men in Spain, of wh
about 75 members of the staff are British, the balance being Spa
latter earning average wages of 15 reals, equal to about 60 cents
8 and 9 hours. There is no Sunday work and the men are paid
labor being both docile and efficient.

The management of the Rio Tinto is progressive, honest and
all departments, and the conduct of this enterprise is marked by a
of friction, despite the great extent of its operations. The Rio Ti
the unique position of being the most profitable as well as the
world's copper mines, and also has the largest ore reserves of any
of any metal.

RIO TINTO COPPER MINING CO.

Organized September, 1902, under laws of Wyoming, with ca
$1,000,000, by residents of Encampment, Wyo., and Lincoln, N

RIO TINTO GOLD & COPPER CO.

Office: Grant Bldg., Los Angeles, Cal. Mine office: Presc
Co., Ariz. E. P. Thom, secretary; A. J. Varney, manager. Land
in the Black Hills district, opened by two 70' shafts giving assay
per ton.

COMPANIA MINERA RIO TINTO MEXICANA.

Office: Chihuahua, Mex. Mine office: Terrazas, Chihuahua,
ploys about 200 men. Juan A. Creel, general manager; D. Min
intendent. Has auriferous and argentiferous copper ores, open
main shaft, and late in 1903 struck 3% nickel ore, apparently in
quantities. Has steam power and a 200-ton smelter.

RIO VISTA GOLD & COPPER MINING CO.

Office: 31 Chronicle Bldg., San Francisco, Cal. Mine offi
El Dorado Co., Cal. Organized January, 1901, under laws of
with capitalization $1,000,000, shares $1 par. D [illegible]
E. P. Colgan, vice-president; F. H. Hood, se
A. G. Gurnett, treasurer. Lands, 2 patente

Fairplay, on the Cosumnes river, known as the Cosumnes mine, showing a 30′ vein giving average assays of about 15% copper and $10 gold and silver per ton, from malachite and bornite, opened by a 150′ shaft and 500′ of tunnels, the Volcano tunnel showing a 10′ vein of bornite. Mine has water power, compressed air hoist and 3-drill Rix compressor, using baby drills, and is building a 30-ton smelter. Company is composed of men of excellent standing and property is considered promising.

RISING SUN COPPER MINING & SMELTING CO. NORTH CAROLINA.

Office: 241 Equitable Bldg., Baltimore, Md. Mine office: Mt. Washington Station, North Carolina.

RIVERSIDE COPPER CO. ARIZONA.

Office: Phoenix, Ariz. Mine office: Morristown, Maricopa Co., Ariz. Idle. Organized under laws of Arizona, with capitalization $2,000,000, shares $1 par. J. M. Graybill, vice-president; Isaac T. Stoddard, agent. Lands, 2 patented and 6 unpatented claims, in the Vulture Mountains, showing self-fluxing carbonate ores. The Copper Bottom claim also shows a good body of slightly argentiferous galena. Property is well considered.

ROB ROY MINING CO. UTAH.

Office: care of Edward McGurrin, secretary, Salt Lake City, Utah. Emanuel Rauch, president. Lands, 4 claims, on Clipper hill, Bingham Canyon, Salt Lake county, Utah.

NEGOCIACION MINERA LA ROCA NEGRA. MEXICO.

Mine office: Velardeña, Durango, Mex. Ernest E. Paine, manager. Operates La Roca and La Victoria mines, producing gold, silver, lead and copper. Main shaft, 500′. Employs about 75 men.

LA ROCA-NEGRITA MINING CO. MEXICO.

Mine office: Velardeña, Durango, Mex. Carlos von Brandeis, sup't.

ROCK LAKE MINING CO., LTD. ONTARIO.

Office: Sault Ste Marie, Ont. Mine office: Bruce Mines, Algoma, Ont. Organized 1899, under laws of Ontario, with capitalization $3,000,000, shares $10 par. M. Wile, president; Henry Weil, vice-president; L. C. Holden, secretary; A. S. Burrows, general manager; Wm. C. Madge, superintendent. Lands, 1,600 acres, in the Aberdeen district, showing chalcopyrite in 30′ fissure veins traceable more or less continuously for 3 miles, and estimated by company to carry an average of 3% copper. Has a 425′ main shaft and 30 tunnels and crosscuts, with about 2,000′ of underground openings. Surface plant includes air compressors and a 200-ton concentrator equipped with crushers, Hodge jigs and Wilfley tables. Mine and mill are served by the Bruce Mines & Algoma railroad, built by a corporation closely affiliated with the Rock Lake company.

ROCKY MOUNTAIN CONCENTRATING & MILLING CO. COLORADO.

Mine office: Black Hawk, Gilpin Co., Colo. Edgar S. Moulton, manager. Ores carry gold, silver and copper. Has gasoline power, 25-stamp mill and 75-ton concentrator.

ROCKY MOUNTAIN COPPER CO. WYOMING.

Office: Marcellus, Mich. Mine office: Encampment, Carbon Co., Wyo.

Employs 3 men. Organized August, 1902, under laws of Wyoming, with capitalization $100,000, shares 10c. par. Geo. W. Kroll, president; Earle R. Clemens, vice-president and general manager; Arthur E. Bailey, secretary; J. V. Goodwin, superintendent. Lands, 8 claims, area 160 acres, in the Upper Platte district, showing oxide and carbonate ores in gossan, opened by sundry pits and shafts, deepest 55′.

BERNARDINO RODRIGUEZ. **MEXICO.**

Office and mine: Mazapil, Zacatecas, Mexico.

SEVERIANO RODRIGUEZ. **MEXICO.**

Office and mine: San Pedro Ocampo, Zacatecas, Mexico.

ROGERS COPPER & IRON CO. **TENNESSEE.**

Office: McComb, Ohio. Mine office: Ducktown, Polk Co., Tenn. Organized June, 1902, under laws of South Dakota. C. H. Shuler, president; C. S. Hoskinson, vice-president; W. J. Stark, secretary; C. C. Glecker, treasurer; J. A. Ewing, general manager. Property is 300 acres of copper and iron lands, in the extreme southeastern corner of Tennessee.

LA ROMANERA GROUP. **SPAIN.**

Owned by M. Yglesias, 2, Tokenhouse Bldgs., London, E. C., Eng. Group includes the San Vicente and other mines, near Paimogo, Huelva, Spain, showing several veins, largest about 40′ wide at top and increasing with depth, carrying cupriferous iron pyrites, with gold and silver values.

ROOSEVELT GOLD & COPPER MINING CO. **ARIZONA.**

Office: care of W. G. McDonald, president and general manager, P. O. Box 477, Bisbee, Ariz. Property is 15 miles from Ft. Thomas, Graham county, on the Gila Valley, Globe & Northern R. R., developed by a 60′ shaft showing cuprite, malachite, chalcocite and chalcopyrite giving good assay values.

RÖROS KOBBERVAERK. **NORWAY.**

Mine office: Röros, Trondjhem, Norway. A group of old mines, opened circa 1646, including the Storvarts, Kongens, Kristian VI and Muggruben, these being owned partly by the state. Employed 600 men in 1901. Ores range 4.5% to 5% in the Kongens group; 6% to 7% in the Storvarts, and about 5% copper in the Muggruben. A little prospecting has also been done on an adjoining group of claims. Production in 1898 was 1,383,077 lbs. refined copper, and in 1902 was about 25,000 tons of ore averaging 5% to 6% copper after roasting.

MINA EL ROSARIO. **CHILE.**

Mine office: Tamaya, Ovalle, Chile. Owned by the Familia Lecaros. Mine was opened in 1850 and is about 550′ deep. Idle.

COMPANIA MINERA ROSARIO. **ARGENTINA.**

Property is located in the Calamuchita district, about 60 miles southwest of Córdoba, Argentina. Ore body is iron pyrites carrying chalcopyrite, with quartz gangue, averaging 5% to 6% copper. Has a smelter with 36″ blast-furnace, making matte averaging 65% copper and 30 oz. silver per ton, which is sent to Great Britain for reduction and refining.

ROSE MINE. **CALIFORNIA.**

Office: care of R. S. Grant, owner, Victor, Cal. Property is in the Morongo district, 45 miles southeast of Victor, San Bernardino Co., Cal. Ores carry copper, gold and silver, the copper ore being hand-sorted and shipped to smelter.

ROSEMAN GROUP. **CALIFORNIA.**

Owned by H. Roseman, et al, Redding, Shasta Co., Cal. Lands, 9 claims and smelter site. Ores are carbonates and oxides at surface, sulphides at depth. Property is slightly developed by shafts and tunnels.

ROSEMONT COPPER CO. **ARIZONA.**

Mine office: Rosemont, Pima Co., Ariz. Has steam power and 50-ton smelter. Idle.

ROSSLAND-KOOTENAY MINING CO., LTD. **BRITISH COLUMBIA.**

Offices: Salisbury House, London, E. C., Eng. Mine office: Rossland, B. C. Bernard MacDonald, general manager; F. A. Labouchere, secretary. Registered May 17, 1902, as reconstruction of Rossland-Great Western Mines, Ltd., and Kootenay Mining Co., Ltd., with capital of £150,000. Lands, 204 acres, carrying gold, silver and copper ores, which are shipped to the Northport smelter.

ROUILLARD COPPER MINES. **NEW HAMPSHIRE.**

On Mt. Gardner, near Woodsville, Grafton Co., N. H. Idle.

ROUSE-GARDNER MINING CO. **COLORADO.**

Mine office: Central City, Gilpin Co., Colo. J. W. Bostwick, manager. Operates the Gardner mine, carrying gold, silver and copper. Has steam power and employs 25 men.

ROUTT COUNTY GOLD & COPPER MINING CO. **COLORADO.**

Office: 635 Seventeenth St., Denver, Colo. W. T. Perkins, president; F. E. Coe, secretary and treasurer. Organized March, 1903, under laws of Wyoming, with capitalization $1,500,000, shares $1 par. Lands, 5 claims, area 50 acres, in Routt county, Colorado, 100 miles from nearest railroad, developed by about 1,000′ of tunnels and showing a considerable quantity of ore assaying $3.50 to $150 per ton, in gold, copper, silver and lead.

ROWAN GOLD & COPPER MINING CO. **NORTH CAROLINA.**

Office: Salisbury, N. C. Alvin Merriam, superintendent. Operates the Oddie gold-copper mine. Has steam power and 10-stamp mill, and leaches concentrates by the Mead process.

ROYAL COPPER CO. **NEW MEXICO.**

Absorbed by the Aberdeen Copper Co. in 1901.

ROYAL GOLD & COPPER CO. **UTAH.**

Office: Dooly Blk., Salt Lake City, Utah. Mine office: Milford, Beaver Co., Utah. Organized March, 1903, under laws of Colorado, with capitalization $10,000,000, shares $10 par. A. B. Lewis, president; C. J. Caughey, vice-president; Jos. Henshaw, secretary. Lands, 200 claims, area 4,000 acres, including the Montreal, Gogebic, Colossal, Lewis, Beacon, Nellie, Monitor, Adams, Muldoon and other groups, in Beaver, Washington and Iron counties, Utah, but mainly in the vicinity of Milford. The Montreal group is the best known, and it is asserted that upwards of $1,000,000 in copper, lead, silver and gold has been produced by this property in the past. Is undergoing development, and company has authorized a $2,000,000 bond issue at 6%. Company has ambitious plans for the future, including the erection of a 1,000-ton furnace at Milford. Company was promoted and organized by Senator Lewis, who also organized the Majestic, in the same neighborhood, and it is to be hoped that the lessons taught by the troubles of the Majestic will cause Senator Lewis to promote the Royal company along somewhat more conservative lines than his previous floatation. The landed holdings are considered valuable, but the value of the shares is necessarily dependent upon the basis, substantial or otherwise, on which the company is organized and operated.

ROYAL CROWN MINING CO. **MEXICO.**

Office: Independencia No. 38, Oaxaca, Mex. Mine office: Ocotlán, Oaxaca, Mex. Employs 75 men. Organized under laws of Mexico, with capitalization $300,000, shares $1 par; paid in, $135,000. Gustavo Stein, president; Teodoro Meyer, secretary and treasurer; A. Hopley Woolrich, general manager; Martin Aguirre, superintendent. Lands, 80 acres, also a 10-acre smelter site, in the Ocotlán district, showing 4 contact veins between quartzite and andesite, of which two are being developed, these averaging 3 metres width and giving average assays of 13% copper, 739.66 grams silver and $23 gold per ton, from malachite, azurite and chrysocolla in the oxidized zone, and chalcopyrite below the water-level. Is opened by shafts of 122′ and 125′ and served by the Ocotlán & Ejutla railway, ½ mile distant.

ROYALBERG COPPER MINES, LTD. **NORWAY.**

Offices: 64, Victoria St., Westminster, London, Eng. Mine office: Kongsberg, Norway. Employs 50 men. Registered April 24, 1903, with capital, nominal, £40,000; issued, £35,000. S. Philip Eastick, managing director; Ingwolf Otterbeek, superintendent. Lands, 18 claims, area about 50 acres, title by crown grant, also 20 acres timber lands, in the Fiskum district, opened by shafts of 40′, 70′, and 100′, and by tunnels of 120′ and 250′, showing four 3′ fissure veins in volcanic mica-schists, giving average assays of 14% copper, 20% lead, 10% zinc and 24 oz. silver per ton, from sulphide ores, and estimated to show 30,000 tons of ore, with 15,000 tons blocked out for stoping. The West Norway railroad is 2 miles distant, and it is proposed to develop 100-h. p. from a nearby waterfall.

RUBY COPPER & GOLD MINING CO. **WYOMING.**

Supposed to have property somewhere in Carbon county, Wyoming.

RUBY GOLD & COPPER CO. **MEXICO.**

Office: 30 Broad St., New York. Mine office: San Marcial, Sonora, Mex. Floyd B. Wilson, president; Fredk. K. Jones, secretary and treasurer; Geo. W. Crowe, general manager; Chas. R. Davenport, superintendent. Organized under laws of Arizona, Nov. 28, 1900, with capitalization $2,000,000, shares $10 par, with $100,000 in 10% cumulative preferred stock. Ores are gold and copper. Is installing mining machinery and reduction plant.

RUBY HILL COPPER MINING & SMELTING CO. **CALIFORNIA.**

Mine office: Copper Hill, California.

RUBY HILL TUNNEL & MINING CO. **NEVADA.**

Mine office: Eureka, Eureka Co., Nev. Is driving a 2,200′ tunnel between the Richmond and Connor mines.

RUBY KING COPPER MINING & TOWNSITE CO. **CALIFORNIA.**

Lands, 11 claims in Sections 29 and 32, T. 17 N., R. 6 W., Colusa Co., Cal., showing float copper.

RUDEFEHA MINE. **WYOMING.**

Absorbed by North American Copper Co.

RUDIANSKI MINES. **RUSSIA.**

Office: care of T. L. Zamiatnin, Perm, Russia. Property is a group of mines in the government of Perm. Production in 1899 was 3,122,112 lbs. of refined copper.

MARCOS RUSSEK. **MEXICO.**

Office and mine: Jiminez, Chihuahua, Mexico.

RUSSELL UNITED COPPER CO. **NEW MEXICO.**

Incorporated 1903, under laws of Delaware, with capitalization $1,000,000, by J. Howard Gendell, et al, of Philadelphia, Pa.

RUTHBERG CONSOLIDATED COPPER CO. **IDAHO.**

Letter returned unclaimed from former office, Banigan Bldg., Providence, R. I. Lands, 112 acres, in the Seven Devils district, Idaho.

SACAJEWEA GOLD & COPPER MINING CO. **MONTANA.**

Office: care of W. J. Anson, secretary, Helena, Mont. Capitalization $5,000,000, shares $10 par. Colonel Henry Altman, president. Lands, 47 claims, near Helena, Lewis & Clarke, county, Montana.

SADDLE MOUNTAIN MINING CO. **ARIZONA.**

Office: 1008 F St., Washington, D. C. Mine office: Dudleyville, Pinal Co., Ariz. Employs 25 men on development work. Dr. Z. Taylor Emery, president; Storey D. Ladd, secretary; Wilbur W. Delano, treasurer; Geo. B. Chittenden, general manager; N. H. Mellor, superintendent. Organized 1902, under laws of Arizona, with capitalization $250,000, shares $1 par; unissued, $120,000. Lands, 30 claims, area 600 acres, also 40-acre smelter-site and sundry coal lands, to be developed later, also lands in Pinal and Gila counties, giving total holdings of 3,400 acres. Has a contact vein between limestone and porphyry, showing carbonate ore with garnet gangue on the limestone wall, and sulphides along the porphyry contact at depth, ores averaging 4% copper and 2 oz. silver per ton. Has shafts of 50′, 75′, 118′ and 120′, also 3 crosscut tunnels, longest 175′, and 5 tunnels in ore, longest 180′. Property was discovered about 1880, but after slight development was found to be in the San Carlos Indian Reservation, hence was closed down until restored to the public domain by executive orders of the president, December 2, 1902. Has a 20-ton concentrator, with jaw-crusher and Bartlett table, also an old smelter with 2 small water-jacket blast furnaces, erected in 1880 by the San Carlos Copper Co. One carload of ore, shipped for treatment in 1903, gave returns of 9.2% copper. Sundry claims held under bond and lease are to be purchased early in 1904, previous to which the company will be reorganized with largely increasd capital, after which it is planned to develop systematically and extensively. Property is regarded as valuable.

SAGINAW MINE. **MONTANA.**

Letter returned unclaimed from Dillon, Beaverhead Co., Mont.

SAGINAW MINING CO. **WASHINGTON.**

Mine office: Maple Falls, Wash. Has copper-gold ores.

SAGINAW VALLEY COPPER MINING CO. **WYOMING.**

Office: Bay City, Mich. Letter returned unclaimed from former mine office, Encampment, Carbon Co., Wyo. Organized 1902, under laws of Wyoming, with capitalization $2,000,000, shares $1 par. E. L. Beach, president; Alex. Zagelmeyer, vice-president; J. E. Hawkins, secretary; Herman R. Marwinske, treasurer; Jos. Walton, superintendent. Has absorbed the Green Mountain and Grand Rapids Copper companies, exchanging stock therefor. Lands, 100 acres, developed by 100′ shaft and 73′ tunnel.

SAHUARIPA EXPLORATION CO. **MEXICO.**

Mine office: Sahuaripa, Sonora, Mex. Has bought and bonded a number of properties in the Sahuaripa district, among these being the Mina Esperitu Santo, 12 miles east of Sahuaripa, opened circa 1842, and closed in 1900, owing to striking of water. This has a blanket vein of argentiferous and plumbiferous tetrahedrite, carrying up to 150 oz. to 250 oz. silver per ton.

SAHUAYACAN MINING CO. **MEXICO.**

Office: Pittsburg, Pa. Mine office: Jesus Maria Ocampo, Chihuahua, Mex. Leo Reed, manager. Operates the Veronica and other mines, producing gold, siilver and copper. Main shaft, 350′. Has steam power and a 20-stamp mill, employing about 100 men.

ST. CROIX CONSOLIDATED COPPER CO. **WISCONSIN.**

Office: Superior, Wis. Organized 1903, under laws of Wisconsin, with capitalization $1,500,000, shares $1 par. Lands, 9 groups, area 22,000 acres, in Douglas county, Wisconsin, carrying the western extension of the Keweenawan copper belt of Michigan.

ST. DAVID'S GOLD & COPPER MINES, LTD. **WALES.**

Offices: Cornhill, London, E. C., Eng. Mine office: Barmouth, North Wales. G. C. Isaacs, chairman; H. J. Wright, mine manager; J. Junner, secretary. Capital, £60,000. Lands, 730 acres, carrying gold and copper ores. Has a 50-stamp mill and Elmore oil concentrator, latter treating tailings from mill. Concentrator has given excellent results.

ST. GEORGE COPPER MINING CO. **UTAH.**

Office: Salt Lake City, Utah. Mine office: St. George, Washington Co., Utah. Capitalization $400,000. Clarence McCornick, president; Grant C. Snyder, secretary and manager. Lands are in the Dugway Mountains. Main shaft, 100′, on a 4′ to 5′ vein, giving assays of 4% to 40% copper. Has gasoline power and a small smelter.

ST. JOE MINING CO. **UTAH.**

Office: 61 Commercial Blk., Salt Lake City, Utah. Mine office: Bingham Canyon, Salt Lake Co., Utah. Capitalization $1,000,000, shares $1 par. R. A. Hasbrouck, president; Wm. S. Burton, secretary. Lands, 17 claims, area 340 acres, having more than a mile of underground openings. Principal opening is the St. Joe deep tunnel, which is to be driven about a mile, and should open large ore bodies at great depth.

ST. JULIAN MINING CO. **MONTANA.**

Office: Livingston, Mont. Mine office: Chico, Park Co., Mont. J. F. Nolan, manager. Lands include the Berery, Bullion and Copper Queen claims, carrying gold, silver and copper. Has steam power and Elspass mill.

ST. LAWRENCE GROUP. **WASHINGTON.**

Office: 312 Trader's Blk., Spokane, Wash. Owned by W. R. Marvin, T. H. Boyd and P. F. McLaughlin. Lands, 4 claims, in the Twisp district, Cascade Mountains, Washington, about 60 miles from a railroad, showing a strong vein giving assay values of about $40 per ton in copper, gold and silver.

ST. LOUIS MINE. **NEW MEXICO.**

Mine office: Silver City, Grant Co., N. M. Geo. Newcomb, manager. Shipped ores averaging 15% to 25% copper to smelter at Silver City before that plant was burned. Main shaft, 500'. Has solid sulphides below 200', oxidized ores above. Owners contemplate installing a leaching plant to treat 5% to 20% ores.

ST LOUIS MINE. **WASHINGTON.**

Mine office: Silverton, Snohomish Co., Wash. Has vein of 18" to 36" showing auriferous and argentiferous chalcopyrite assaying 20% copper.

ST. LOUIS COPPER CO.

Former office, 721 Olive St., St. Louis, Mo. Dead.

ST. LOUIS COPPER CO. **ARIZONA.**

Mine office: Gila Bend, Pima Co., Ariz. A. J. Shotwell, superintendent. Ores carry gold and copper. Has steam power and 10-stamp mill.

ST. LOUIS-VASSAR MINE. **UTAH.**

Mine office: Park City, Summit Co., Utah. Robert Gorlinski, manager. Ores carry mainly silver, with fair values in copper, lead and gold. Employs 15 men.

ST. MARIE COPPER CO.

Former office in the Cooper Bldg., Denver, Colo. A deliberate swindle, perpetrated by John Reilly and W. W. Wilson, two notorious confidence men.

ST. MARY'S MINERAL LAND CO. **MICHIGAN.**

Office: P. O. Box 5095, Boston, Mass. Local office: Houghton, Houghton Co., Mich. Organized 1901, under laws of New Jersey, with capitalization $5,000,000, shares $25 par; issued, $3,498,250. Company holds the entire stock issue, except founders shares, of St. Mary's Canal Mineral Land Co., organized 1863, under laws of New York, to take over lands given by the state for construction of the first ship canal at Sault Ste. Marie, lands so given being 180,000 acres in Houghton, Ontonagon and Keweenaw counties, and from which tract the Calumet & Hecla, Tamarack, Baltic, Trimountain, Champion and other mines have been developed. Nathaniel Thayer, presi-

dent; Chas. J. Paine, vice-president; Arthur G. Stanwood, secretary and treasurer; preceding officers, Samuel N. Brown, Albert S. Bigelow, J. Henry Brooks, Chas. E. Perkins, W. Cameron Forbes, Geo. P. Gardner, Walter Hunnewell, Chas. N. King, directors; R. R. Goodell, local manager.

Lands, 96,989 acres in fee, and mineral rights to 14,193 additional acres, lands being scattered along the Lake Superior copper belt, with principal holdings on the South Range, southwest of Houghton. Other assets are: 50,000 shares of stock of the Champion Copper Co., being a one-half interest in that corporation; 20,000 shares Pacific Copper Co.; 86 shares Copper Range Co.; 842 shares Winona Copper Co.; 80 shares Old Colony Copper Co.; 122 shares Trimountain Mining Co.; 25,000 shares Mayflower Mining Co. From 1863 to 1900 the old company paid cash dividends of $2,200,000, also stock dividends of one share of Tamarack, one share Iroquois, 1½ shares Baltic, ½ share Winona and ½ share Albany & Boston, on each share of St. Mary's stock. A dividend of $1, amounting to $150,000, was paid October 1, 1903, last preceding dividend having been $4, paid November 28, 1899. Expenditures in 1902 were $319,298, of which $115,000 went to the Champion as loans. Exploratory work is being done by 2 diamond drills, with a force of 16 men. These drills were worked in 1903 at points 2 to 5 miles south of the Champion mine, but owing to the great depth of overburden it was difficult, and in the case of some holes, impossible, to reach the solid ledge, hence drilling operations have been transferred to the vicinity of the Winona mine, where conditions for drilling are more favorable.

ST. MICHAELS MINING, MILLING & REFINING CO. NEW MEXICO.

Mine office: Tres Piedras, Taos Co., N. M. A. York, superintendent.

ST. PAUL MINE. COLORADO.

Mine office: Red Mountain, Ouray Co., Colo. T. Braden, owner; J. I. Sweet, superintendent. Ores carry silver, lead and copper. Has steam power.

ST. REGIS COPPER MINING & MILLING CO. MONTANA.

Mine office: St. Regis, Missoula Co., Mont. Fred W. Wilson, superintendent. Ores carry copper and gold. Has steam power.

SALIDA GOLD & COPPER CO. MEXICO.

Office: care of Dr. Finis E. Yoakum, 213 Grant Bldg., Los Angeles, Cal. Letter returned unclaimed from former mine office, Alamos, Sonora, Mex.

SALIDA GOLD & COPPER MINING CO. COLORADO.

Mine office: Salida, Chaffee Co., Colo. Capitalization $100,000, shares $1 par. E. B. Green, manager; Francis Shine, secretary. Ores carry copper and gold. Is building a 3-story and basement 100-ton concentrator and leaching plant to treat 3% copper ores from the Salida mine, held under a 10-year lease.

SALISBURY COPPER CO. NORTH CAROLINA.

Office: Salisbury, N. C. Organized 1903, under laws of Arizona, with capitalization $100,000, by W. S. Blackmer, et al. Is developing a 15′ vein showing excellent copper ores.

SALMON RIVER MINING CO. NEVADA.

Mine office: Contact, Elko Co., Nev. Moses Jones, superintendent. Ores carry gold, silver and copper. Has gasoline power and a small smelter.

SALT LAKE COPPER CO.

Letter returned unclaimed from former office in Salt Lake City, Utah.

COMPANIA MINERA DE SALTILLO. MEXICO.

Office: 9A de Hidalgo, Saltillo, Coahuila, Mex. Mine office: Concepcion del Oro, Zacatecas, Mex. Antonio Rodriguez, president; Angel Rios, manager. Operates the Jesus Nazareno mine, producing gold, silver, lead and copper. Has steam power and employs 200 men.

SAMSON GROUP. BRITISH COLUMBIA.

Promising sulphide outcrops at Beasley, 7 miles west of Nelson, B. C.

SAMSON MINE. UTAH.

Sold in March, 1903, to Bingham Copper & Gold Mining Co.

COMPANIA MINERA DE SAN ACASIO Y ANEXAS. MEXICO.

Mine office: San José de Guadalupe, Durango, Mex. Is a producer of iron ore, copper and gold, and employs about 100 men.

COMPANIA MINERA DE SAN ANTONIO. MEXICO.

Mine office: La Cruz, Tamaulipas, Mex. Alex. Dozal, manager. Ores carry copper, lead and silver. Employs about 40 men.

SAN BARTOLO COPPER MINES, LTD. CHILE.

In voluntary liquidation. Lands are near Antofagasta, Chile.

SAN BERNARDINO COPPER CO.

Capitalization $2,500,000—$500 paid in. Lands, 360 acres.

SAN CARLOS COPPER CO. ARIZONA.

Property is under bond to the Saddle Mountain Mining Co.

SAN CARLOS COPPER CO. MEXICO.

Office: 25 Broad St., New York. Mine office: Linares, Nuevo Leon, Mex. Employs about 800 men. Organized 1896, under laws of New York, with capitalization $100,000, shares $1 par. W. H. Nichols, Jr., president; S. H. Steele, secretary and treasurer; Edw. D. Self, general manager. Mining lands are 6 square miles, in San Carlos district of Tamaulipas, Mexico, with smelter at San José, Tamaulipas, also 6,400 acres of timber lands. Veins are contacts between limestone and porphyry, and ores are oxides, carbonates and sulphides, mainly the latter. Development is by upwards of 50 shafts and about 7 miles of tunnels, with total underground openings of about 10 miles. Nearest railroad is the Gulf branch of the Mexican Central, 38 miles distant. A railroad to connect the mines and smelter is to be built in 1904. Property is a considerable producer of copper, but figures of production cannot be secured from the Mexican government or the company, or from any other source.

SAN CRISTOBAL COPPER CO. NEW MEXICO.

Office: 616-116 Broad St., New York. Mine office: Arroyo Seco, Taos Co., N. M. Chas. L. Heverin, president and general manager; John McGregor, superintendent. Lands, 1,850 acres, also sundry water-rights and a railroad franchise. Has an 80′ ore body, carrying gold, silver and lead. Has a smelter and cyanide plant, and plans building a 150-ton concentrator. Original development was for copper, but present operations are confined almost exclusively to a big ledge of gold-bearing quartz.

SAN DOMINGO GOLD & COPPER CO. **ARIZONA.**

Absorbed by Picacho Blanco Mining Co.

SAN DOMINGOS MINE. **PORTUGAL.**

Owned and operated by Mason & Barry, Ltd.

SAN FERNANDO COPPER MINING & SMELTING CO. **MEXICO.**

Office: care of Woods Investment Co., Victor, Colo. Mine office: Ensenada, Baja California, Mex. Works a small force on development. Organized 1894, under laws of Colorado, with capitalization $1,000,000, shares $1 par. F. M. Woods, president; H. E. Woods, vice-president; Warren Woods, treasurer; John V. Smale, general manager. Lands, 80 pertenencias, showing 8 veins 2′ to 6′ in width and averaging 6% copper from oxide, carbonate and sulphide ores of copper, with small values in gold and silver.

MINA SAN FRANCISCO. **PERU.**

See Compania Minera Santa Ines y Morococha.

MINAS DE SAN FRANCISCO Y OTRAS. **MEXICO.**

Mine office: care of G. V. Monteverde y Ca., owners, Pesqueria, Sonora, Mex. Ores carry gold, silver, lead and copper.

NEGOCIACION MINERA SAN FRANCISCO Y ANEXAS. **MEXICO.**

Mine office: Mineral de Asientos, Aguascalientes, Mexico.

COMPANIA MINERA DE LA FRANCISCO DEL AZUL. **MEXICO.**

Mine office: Matehuala, San Luis Potosi, Mexico.

FINCA SAN JOAQUIN. **CUBA.**

An old mine, about 30 miles northeast of Cienfuegos, Cuba, worked intermittently 1856-1885, ores having been shipped to Swansea and the United States for smelting, and returning an average of nearly 20% copper. Vein ranges up to 30′ in width. Ores are azurite, melaconite, cuprite, bornite and chalcopyrite.

SAN JOSE MINE. **CHILE.**

Mine office: care of Silva y Rivas, owners, Tamaya, Ovalle, Chile. Mine was opened in 1844 and is 517′ deep.

MINAS SAN JOSE, SAN MIGUEL Y EL BRUJO. **SAN SALVADOR.**

Office and mines: care of Luna Hermanos, owners and managers, Metapán, San Salvador, Central America. Ores carry copper, gold and silver. Have steam power and smelter, employing about 250 men.

SAN JUAN GROUP. **CHILE.**

Mine office: Copiapo, Atacama, Chile. Deepest shaft, about 1,800′. Originally worked for silver, but copper values predominate at depth.

MINA DE SAN JUAN. **SPAIN.**

Mine office: Paimogo, Huelva, Spain, Don José De Soto, manager. Lands, 102 hectares, including 4 old mines.

SAN JUAN MINING CO. **COLORADO.**

Mine office: Central City, Gilpin Co., Colo. J. I. Perkins, manager. Ores carry gold, silver and copper. Has steam power.

SAN JUAN SMELTING & REFINING CO. **COLORADO.**

Mine and works office: Silverton, San Juan Co., Colo. Geo. Oliver, president; W. F. Kendrick, vice-president; F. C. Kendrick, general manager. Organized 1903, with capitalization $3,000,000, as a consolidation of the Kendrick & Gelder Smelting Co., Oliver Reduction Co. and Paradox Copper-Gold Mining Co. Principal mining property is the Henrietta, carrying ores of gold, silver and copper and equipped with gasoline and electric power, with a 400-ton concentrator and 200-ton smelter, employing about 200 men.

MINA SAN JUAN DE MALAJA. **CUBA.**

A promising prospect, with 100′ gossan capping, about 6 miles northeast of Santa Clara, Cuba.

MINAS SAN LORENZO Y ALLENDE. **MEXICO.**

The San Lorenzo and Allende mines, area 36 pertenencias, or about 90 acres, in the Ures district, Sonora, Mexico, were bought by Frederick A. Platt, et al, in 1902, and are being developed. The San Lorenzo has a 4′ vein assaying as high as 18% copper and 30 oz. silver per ton. The Allende is not so rich, but is said to be a promising property.

COMPANIA MINERA SAN LUIS. **MEXICO.**

At Tepezalá, Aguascalientes, Mex. Sold to Aguascalientes Metal Co.

SAN LUIS MINING CO. **MEXICO.**

Office: 27 William St., New York. Mine office: Gabriel, Durango, Mex. Employs 750 men. Organized 1900, under laws of West Virginia, with capitalization $1,850,000, shares $10 par; unissued, $125,000. Assets, $1,384,345.86; liabilities, $61,561.83; cash on hand, $45,000; cash due company, $39,500. Walter S. Logan, president; Myra B. Martin, secretary; Geo. A. Treadwell, treasurer; Louis Ross, general manager; Henry E. O'Driscoll, mine superintendent; Frederic Sustersic, mill superintendent; Sydney B. Tyler, engineer. Mining lands, 850 acres, also 10-acre smelter-site and sundry timber lands, etc., giving total holdings of 46,160 acres, in the Panuco de Coronado and San Lucas districts of Durango. Has about 60 fissure and contact veins, of which 3 are being developed, these having average widths of 20′, and reported by company to carry an average of 6% copper, 15% lead, 25% zinc, 60 oz. silver and $8 gold per ton, from oxide, carbonate and sulphide ores. The San Luis mine has a 400′ shaft and tunnels of 250′ and 350′; the Potosina No. 1 has shafts of 250′ and 400′, the San Lucas has 2 shafts of 150′ each and tunnels of 1,200 and 300′. Total underground openings are about 4 miles, estimated to show 275,000 tons of ore blocked out for stoping, with 2,500,000 tons of ore in sight. These are very old mines, reopened in 1901 by the present company. Has steam power, mines using 600-h. p. and mill 200-h. p. Equipment includes 2 Ingersoll air compressors and 10 power drills. Buildings include a 20x60′ stone machine shop, 20x80′ wood carpenter shop, smithy and 60 dwellings. All high-grade ore is shipped to the Monterey and Aguascalientes plants of the Mexican Smelting & Refining Co., over nearest railroad, the Mexican International, 12 miles distant. Fuel is wood, costing $6 per cord, and soft coal costing $15 per ton. Production for 1902 was about $200,000; for 1903, about $600,000, and for 1904 is estimated as likely to be about $1,500,000. Average cost of mining is about $3.50 per ton. For 1904 company will continue underground development, giving attention to several properties not yet opened, install a new hoisting plant, add to present mill, and contemplates building a railroad to connect with the Mexican International. Property is regarded as extensive and valuable.

SAN MARCEL MINE. **ITALY.**

An old mine, of limited production, in Piedemont, Italy.

SAN MARCIAL GROUP. **MEXICO.**

Office and mine: care of Gus Peterson, owner and manager, Rosario, Sinaloa, Mex. Ores carry silver, lead, gold and copper.

SAN MIGUEL COPPER CO. **NEW MEXICO.**

Lands are in the Tecolote district of San Miguel county, New Mexico. Management contemplates installing a 150-ton leaching plant.

SOCIEDAD MINEIRA DE SAN MIGUEL DE HUELVA. **PORTUGAL.**

Mine office: Alamonaster, Huelva, Spain. Lands 112 hectareas. Production in 1899 was 789 long tons of refined copper.

COMPANIA MINERA DE SAN MIGUELITO. **MEXICO.**

Mine office: Cumpas, Moctezuma, Sonora, Mexico.

MINA SAN PEDRO. **ARGENTINA.**

A small mine in the Mexicana district of Rioja, Argentina. Highest grade shipping ore assays up to 30% copper, 30 oz. silver and 0.5 oz. gold per ton.

MINA SAN PEDRO. **MEXICO.**

Mine office: Cedral, San Luis Potosi, Mex. Owned by J. A. Arbide and Roberto Yrizar.

SAN PEDRO COPPER CO. **NEW MEXICO.**

Mine office: San Pedro, Santa Fe Co., N. M. Idle.

SOCIETE ANONYME DES MINES DE SAN PEDRO. **SPAIN.**

Offices: Rue de Chateaudun, 39, Paris, France. Mine office: Zalamea La Real, Huelva, Spain. Lands include the Barranco de los Buyes mine, area 64 hectareas.

COMPANIA MINERA DE SAN PEDRO DE NOLASCO. **CHILE.**

Mine office: San Pedro de Nolasco, Victoria, Chile. Owns the Carlotta mine, opened 1795, and developed by a 700′ tunnel.

SAN PIO MINE. **MEXICO.**

Office: care of Spencer C. Richardson, owner, 40 Water St., Boston, Mass. Is located 12 hours horseback ride southwest of Ameca, Jalisco, Mex.

MINA SAN PLATON. **SPAIN.**

Office: care of Don Antonio Ruiz Cancela, Sevilla, Spain. Mine office: Almonaster, Huelva, Spain. Lands, 46 hectareas. Idle.

SAN REMO COPPER CO. **ARIZONA.**

Letter returned unclaimed from Gleeson, Cochise Co., Arizona.

MINA DE SAN TELMO. **SPAIN.**

Office: care of Ibarra y Hijos, Sevilla, Spain. Mine office: Cortegana, Huelva, Spain. Lands, 222 hectareas, undergoing development.

N TORINA MINES. GREECE.

Mine office: San Torina, Greece. Owned by an Austrian company, Trieste. Ores are oxides and carbonates. Idle.

N TOY MINING CO. MEXICO.

Office: 1314 Wells Bldg., Milwaukee, Wis. Mine office: Santa Eulalia, hihuahua, Mex. Organized under laws of Maine, with capitalization 2,500,000, shares $1 par. T. H. Bowles, president, A. S. Witherbee secretary nd treasurer. Lands, 5 groups of claims, on which extensive development as been secured. Daily production is 150 to 200 tons of ore, said to give et returns of $8 to $10 per ton.

ANTA BEATRIZ MINES. MEXICO.

Mine office: care of Richard Pearce, superintendent, Magdalena, Sonora, ex. Has steam power.

ANTA CECILIA COPPER MINING CO., LTD.

Wound up July, 1901.

ANTA CRUZ MINING CO. ARIZONA.

Office: 368 Stock Yards, Kansas City, Mo. Mine office: Patagonia, anta Cruz Co., Ariz. Employs 6 men. W. W. Hall, president; Geo. W. olen, secretary and treasurer; Wm. M. Schwartz, general manager. Organ-ed October, 1901, under laws of Arizona, with capitalization $1,000,000, ares $1 par. Has $5,000 cash on hand and $1,000 due company, without abilities. Lands, 6 claims, area 120 acres, showing several contact veins iving a general average assay value of 8.5% copper and 2.5 oz. silver per on, mainly from chalcocite. Has shafts of 65′ and 120′, also several short nnels. Mine was discovered 1860, opened 1890, reopened 1900. Has eam and gasoline power and is only 2½ miles from the Sonora branch of ne Southern Pacific railway. Property gives indications of having a large re body at a depth of about 300′, and company plans developing this and uilding a 100-ton smelter during 1904.

ANTA EMILIA COPPER CO. MEXICO.

Office: 69 Wall St., New York, N. Y. Mine office: Coapa, Michoacan, ex. Employs 60 to 75 men. John A. Kennedy, president; A. J. Peyton, ice-president and general manager; Manuel L. Ward, secretary; Joseph . Collinson, superintendent; J. R. Crum, engineer. Organized 1899, under ws of Delaware, with capitalization $1,000,000, shares $1 par. Lands, 3 acres, in the Tacambara district. Principal development is by the apoleon tunnel, about 1,200′ long, and a 175′ shaft. Has good steam lant and mine buildings with accomodations for about 100 workmen. Ores ecured by present development are low-grade, but it is thought that a good ody of high-grade ore may be found at a depth of about 500′ through a ew 2-compartment 5x10′ shaft about 375′ deep at close of 1903.

ANTA EULALIA MINES. MEXICO.

Mine office: Velardeña, Durango, Mex. Ores carry gold, silver, lead nd copper. Main shaft, 220′. Has gasoline power. Employs 35 men.

ANTA FE GOLD & COPPER MINING CO. MEXICO.

Mine office: Alamos, Sonora, Mexico. Cyrus F. Tolman, general manager. Stock is controlled by the International Copper & Gold Co. Is developing 4 gold properties and a silver mine, near Alamos, and is installing a 10-stamp mill.

SANTA FE GOLD & COPPER MINING CO. NEW MEXICO.

Office: 11 Broadway, New York. Mine office: San Pedro, Santa Fe Co., N. M. Idle. Organized 1899, under laws of New Jersey, with capitalization $2,500,000, shares $10 par, as a reorganization of the original Santa Fe company, formed 1888 and bankrupt 1892. Present company began business with $500,000 cash; balance of assets Jan. 1, 1903, was $149,599.94. Annual meeting, fourth Tuesday in January. State Street Trust Co., Boston, registrar; Old Colony Trust Co., Boston, transfer agent. J. H. Susmann, president; Edgar Buffum, secretary and treasurer; J. Parke Channing, consulting engineer. Lands, 3,400 acres of mineral property and 46,000 acres of miscellaneous lands, including coal lands of considerable promise, in the old San Pedro land grant. Mine is opened by a single shaft, on a blanket vein of sulphide ore running 150′ to 175′ thick and dipping at an angle of less than 15°. Ore smelted in 1901 gave average returns of 4.75% copper, $1.50 silver and $1.50 gold per ton, slags showing about 0.5% copper only. It has been alleged that mining and smelting costs were about $7 per ton of ore, but this figure is undoubtedly much too low. Ore is silicious, requiring heavy iron and lime fluxes. The mine has ore reserves of about 30,000 tons blocked out. The smelter, with two 125-ton furnaces, was blown in Jan. 1, 1901, and blown out in the following November. The mine and smelter are 21 miles from the Santa Fe Central Railroad, with a connecting line surveyed, but not built. Much trouble was experienced when the smelter was in blast from shortage of coke supply and inadequate transportation facilities. To operate the property to advantage ore should be concentrated to obviate the smelting of an immense amount of barren material in both ore and fluxes, and proper railroad connections are imperatively demanded for profitable operations. The only work done in 1903 was the boring of 543′ of diamond drill holes. The property is a promising one, and would probably prove profitable if given a concentrator and railroad connection, and worked on a moderately large scale.

SANTA FE MINING & REDUCTION CO. NEW MEXICO.

Said to have been organized recently by Chicago capitalists to operate in the Santa Fe district, but letter returned unclaimed from Santa Fe, Santa Fe Co., N. M.

COMPANIA MINERA SANTA INES Y MOROCOCHA. PERU.

Office: 19B, Aparicio, Lima, Peru. Mine office: Tuctu, Yauli, Peru. Employs about 125 men. Capitalization 1,200,000, sols. Roberto Pflucker, president; Leopoldo Pflucker, vice-president; Vicente Pazos y Sacio, general manager; Delfin Severo, mine superintendent. Lands, 20 patented claims, area 40 hectareas, with 56 square kilometres of miscellaneous lands, in the Morococha district, including the San Francisco mine, opened on a fissure vein of 3′ to 10′ width and 700′ length, giving average returns of 16% copper and 16 oz. silver per ton, from sulpho-arsenide ores of copper, and developed by 3 main tunnels, with about 3,000 metres of underground openings, having about 40,000 tons of ore in sight and 25,000 tons blocked out for stoping. Has a 40-kilowatt Siemens & Halske generator and operates the mine by electricity. Mine is served by the Ferrocaril Central. Product is shipped to England for smelting, averaging about 200 tons monthly of ore dressed up to 26% copper.

SANTA ISABEL MINING & MILLING CO. **COLORADO.**

Office: Colorado Springs, Colo. Mine office: Creston, Saguache Co., Colo. L. N. Fitts, superintendent. Ores carry gold, silver and copper. Has steam power and 100-ton concentrator.

MINA SANTA MARIA. **HONDURAS.**

An undeveloped property at Comayagua, Honduras, said to be a mountain of ore ten miles in circumference, assaying 10% of 75% copper. Would probably shrink about 99% under test of actual work.

SANTA RITA COPPER MINING & SMELTING CO. **ARIZONA.**

Office: Chemical Bldg., St. Louis, Mo. Mine office: care of L. Zeckendorf & Co., Tucson, Pima Co., Ariz. Employs 15 to 20 men. Organized June, 1901, under laws af Arizona, with capitalization $3,000,000, shares $1 par. Henry C. Begole, president; R. W. Gartside, vice-president; John C. Boyd, secretary and general manager; Jos. P. Steele, superintendent. Lands, 40 claims, area 640 acres, also a 20-acre smelter site, in the Santa Rita district, with country rock of granite-porphyry, showing 10 veins, of which 4 are being developed, these averaging 8′ to 30′ width and giving average assays of about 18% copper, 6% to 12% lead, 1% to 3% zinc, 40 oz. to 68 oz. silver and $2 to $8 gold per ton, from sulphide ores, developed by 5 shafts of 20′ to 110′ in depth,and 5 tunnels of 40′ to 260′ length, with 580′ of underground openings. Property is a long distance from railroad connections. Management apparently is honest and capable.

SANTA RITA MINING CO. **NEW MEXICO.**

Office: 85 Ames Bldg., Boston. Mass. Mine office: Santa Rita, Grant Co., N. M. Albert C. Burrage, president; C. D. Burrage, secretary; B. B. Thayer, superintendent. Employs about 75 men directly, with sundry leasers. Lands, 46 patented and 33 unpatented claims, area about one square mile, near Santa Rita, showing rich carbonate and oxide ores near surface. Concentrator, with Wilfley tables, was doubled in size in 1903, now having 180 tons daily capacity. Mine is said in press statements to be producing at the rate of about 600,000 lbs. of refined copper monthly, but this statement lacks verification.

SANTA ROSA COPPER CO. **ARIZONA.**

Office: Clifton, Ariz. Mine office: Metcalf, Graham Co., Ariz. Capitalization $500,000. Joseph A. Tanner, president and manager; L. S. Randolph, secretary.

SANTA ROSA DEVELOPMENT CO. **SONORA, MEXICO.**

Office: Douglas, Ariz. Mine office: Santa Rosa, Sonora, Mex. Employs 40 men. Organized September, 1903, under laws of Arizona, with capitalization $100,000, shares $10 par. Chas. A. Overlock, president; D. E. Heller, vice-president; Thos. A. Rendle, secretary and general manager. Lands, 136 pertenencias, in the Arizpe district, about 15 miles south of Douglas and 3½ miles from the Nacozari railroad, showing three contact veins between porphyry and limestone, developed by 5 shafts, two deepest 170′ and 200′, and 5 tunnels, longest 250′, with 900′ of underground openings, giving average assays of 10% copper, 35% lead, 20 oz. silver and $1 gold per ton. Plans shipping carbonate and oxide ores to the Douglas Reduction Works.

SANTA ROSA DEVELOPMENT CO. **ZACATECAS, MEXICO.**

Office: 20 Broad St., New York, N. Y. Mine office: Mazapil, Zacatecas, Mex. Has gold, silver, copper and lead ores, developed by 1,500′ tunnel, and employs 25 men.

MINA DE SANTIAGO. **MEXICO.**

Letter returned unclaimed from Fuerte, Sinaloa, Mexico.

SANTO NINO MINING CO. **MEXICO.**

Office: Monterey, Nuevo Leon, Mex. Mine office: Symon, Durango, Mex. John Ross, superintendent. Operates El Carmen mine, producing gold, silver and copper. Employs about 25 men.

SAPHO MINING CO. **NEVADA.**

Mine office: Ely, White Pine Co., Nev. C. P. Webber, manager. Has auriferous oxidized ores, assaying 6% to 22% copper, with pay-streak running about $30 gold per ton. Has steam power.

SARATOGA PYRITIC SMELTING CO. **COLORADO.**

Office: 204 California Bldg., Denver, Colo. Mine office: Ironton, Ouray Co., Colo. Ores carry gold, silver, lead and copper. Has steam power and employs 25 men.

SASAGATINI MINE. **JAPAN.**

Mine office: Hatazako-mura, Kanoashi-gori, Iwami, Japan. Has slightly argentiferous chalcopyrite, associated with sphalerite, galena and arsenopyrite, with quartz and lime gangue, in numerous contact veins ranging up to 50′ in width. Production in 1900 was 62,961 momme of silver and 274,412 lbs. of refined copper.

SATER COPPER CO. **NEW MEXICO.**

Office: 314 Columbia Bldg., Columbus, O. Mine office: Clayton, Union Co., N. M. Employs 6 men. Organized December 19, 1903, under laws of New Mexico, with capitalization $2,500,000, shares $1 par. Jared Sater, president and general manager; Elmer E. Legg, secretary and treasurer; W. D. Mackey, superintendent. Lands, 20 claims, area 615 acres, also a 5-acre smelter site, in the Black Mesa district. Country rock is sandstone, showing 4 veins said by company to average 25′ width and to give average returns of 18% copper, 7 oz. silver and $2 gold per ton, from carbonates at surface and sulphides at depth, opened by a 300′ tunnel, with about 500′ of underground openings, estimated by company to show 2,000,000 tons of ore, which is manifestly impossible. Company plans erecting a leaching plant, deepening shafts, adding steam power, and hopes to have a mill in operation before the close of 1904.

SAUK RIVER MINING CO. **WASHINGTON.**

Office: 327 Pacific Blk., Seattle, Wash. Mine office: Darrington, Snohomish Co., Wash. Organized 1898, under laws of Washington, with capitalization $200,000, shares 50c. par. Harold G. Price, president and treasurer; Wm. Van Waters, secretary. Lands, 9 claims, in 3 groups, area 180 acres, carrying 3 veins of auriferous and argentiferous copper ore. Vein at Blue Bird group is said to be 98′ wide, between porphyry and slate, carrying 3 paystreaks, of 2′, 4′ and 6′, balance of vein being a low-grade self-fluxing concentrating ore.

SAULT PROSPECTING & DEVELOPMENT CO. **ONTARIO.**

Office: Sault Ste. Marie, Mich. R. N. Adams, secretary. Idle. Has a quartz vein carrying chalcopyrite, about 25 miles north of the Bruce mines, in Concessions 4 and 5, Morin Twp., Algoma, Ontario.

SAULT GRAY COPPER CO. **ONTARIO.**

Absorbed by Copper Queen Mining Co. (of Ontario).

SAUX HEAD COPPER MINING CO., LTD. **MICHIGAN.**

Office: 29 Home Bank Bldg., Detroit, Mich. Mine office: Marquette, Marquette Co., Mich. Employs 15 men. Organized Augus 13, 1902, under laws of Michigan, with capitalization $2,500,000, shares $1 par. Chas. A. Stringer, president and general manager; Frank M. Moore, vice-president; John G. Kreig, secretary; Frank E. Kreig, superintendent; Chas. H. Kreig, clerk. Lands, 200 acres, owned in fee, in the Sauk's Head district, northwest of Marquette, showing two ore bodies said by company to occur as impregnations in granite and diorite, opened by a 115′ shaft and 3 short tunnels, giving assays of 1% to 2% copper, 1oz . to 5 oz. silver and $4 to $195 gold per ton, from chalcopyrite. Has steam power and a 5-drill air compressor, with necessary mine buildings. Nearest railroad is 12 miles. Company plans sinking to depth of 400′ and developing therefrom, also driving a new tunnel.

SAVAGE COPPER CO. **WYOMING.**

Letter returned unclaimed from Encampment, Carbon Co., Wyo.

SAVAGE GOLD & COPPER MINING CO. **COLORADO.**

Office: care of T. H. Thomas, lessee, Cripple Creek, Colo.

SAWATARI MINE. **JAPAN.**

Mine office: Kitakata-mura, Higashi-gori, Hyuga, Japan. Adjoins the Hibira mine, and is owned and operated by the Mitsu Bishi Gosshi Kwaisha. Ore occurs as small lenses in paleozoic clay-slate and sandstone. Production in 1900 was 137,191 lbs of refined copper.

SAYLER MINE. **CALIFORNIA.**

Office and mine: Garlock, Kern Co., Cal. N. N. Sayler, owner.

SCANTIC GOLD MINING & MILLING CO. **COLORADO & MEXICO.**

Office: 206 Continental Bldg., St. Louis, Mo. Mine offices: White Cross, Col., and Charcas, San Luis Potosi, Mex. John H. Hammond, Denver, president and general manager; W. F. Smith, superintendent of Colorado property, which has steam power, and is developing ores of gold, silver, copper and lead, with a force of 25 men. Joseph T. Murphy, manager of Mexican property, which includes the San Sebastian and extensions, carrying silver, lead

SENECA MINE. **MICHIGAN.**

A tract of 1,888 acres just north of the Mohawk and Ahmeek mines, in Keweenaw county, Michigan. Fully described in Vol. II.

SOCIEDAD MINERA SERENA. **CHILE.**

Mine office: La Serena, Coquimbo, Chile. Has steam power and employs about 100 men.

SEVILLA SULPHUR & COPPER CO., LTD. **SPAIN.**

Office: Patio de Banderas, 4, Sevilla, Sevilla, Spain. Mine offices: Almonaster, Huelva, Spain, and Aznalcollar, Sevilla, Spain. John McDougall, manager. Operates the Cuchichon and adjoining mines at Almonaster, mining cupriferous iron pyrites, from which considerable copper is secured by smelting the cinder left after burning the ore for sulphur. Annual production is about 3,000,000 lbs. of refined coppper.

SEYMOUR COPPER MINING CO., LTD. **BRITISH COLUMBIA.**

Offices: 41, John Dalton St., Manchester, Eng. H. J. Challoner, secretary. Capital, nominal, £2,000. Organized June 25, 1900, to acquire copper properties at Seymour Narrows, Vancouver Island, B. C.

SHAFTER MINING CO. **COLORADO.**

Mine office: Idaho Springs, Clear Creek Co., Colo. Arthur H. Roller, superintendent. Ores carry gold, silver and copper. Has steam and electric power, employing 20 men.

SHANNON COPPER CO. **ARIZONA.**

Office: 10 P. O. Sq., Boston, Mass. Mine office: Clifton, Graham Co., Ariz. Employs about 300 men. Organized 1899, under laws of Delaware, with capitalization $3,000,000, shares $10 par. Has an outstanding bond issue of $540,000, at 7%. Geo. C. Gill, president; John F. Alvord, vice-president; John K. Erskine, Jr., secretary; James W. Hazen, treasurer; preceding officers, Wm. B. Thompson, Edwin A. Carter, Leonard Wheeler, John W. Belches, Jas. Virden, directors; J. W. Bennie, general manager; Will T. Climo, mining captain; G. G. Davies, mechanical engineer; John A. Church, consulting engineer; Wm. Carkeek, mill superintendent.

Lands, 43 claims, area 400 acres, at Metcalf, in the Greenlee district, also 400-acre mill and smelter sites. The Shannon has a side-line agreement with the Arizona Copper Co., by which extra-lateral rights are mutually waived and all possibility of future litigation removed. Ore occurs as very irregular bodies between limestone and porphyry, these having very heavy gossan cappings of fairly good hematite, oxidized ores favoring the limestone, while ore deposits of the porphyry are mainly silicious sulphides. The mine shows oxide and carbonate ores, averaging from 4% to 10% copper, in the upper levels, and sulphide ores, averaging from 3% to 7% copper, in the lower workings, the sulphide ores being mainly chalcopyrite, with more or less chalcocite. The mine is opened by shafts and tunnels to a depth of 1,100′ from the crest of the mountain, mine openings being timbered with 12x12″ square sets. The mine has about 6 miles of underground openings, with ore reserves estimated as sufficient for 4 to 5 years production. The 7x8′ operating tunnel is 715′ long and is connected with a 1,400′ double track incline tram, leading to the Coronado railroad, with 6 ore bins at either end, the track having an inclination of 36°. The incline has 10-ton cars operated in counterbalance, the steel cable passing around a 13′ double drum at the top, which in addition to lowering the loaded and raising the empty cars, runs a small air-compressor that generates power while serving as an auxiliary brake.

The concentrator, located on the San Francisco river, 8 miles from the mine, is of steel, in two connected sections, the 64x95′ upper section, having a 9x15″ Blake crusher at the ore bin, Huntington mills and a 220′ Robins belt conveyer, trommels and jigs. The 57x144′ lower section has 18 Frue vanners and slime tables. The 32x50′ steel power house has two 250-h. p. Stirling water-tube boilers, and a 300-h. p. Nordberg tandem compound engine. Ore is concentrated about 5 into 1. The first 250-ton section of the concentrator was in operation late in 1903, with the second section planned to go into commission early in 1904. Water is pumped from wells near the river by a 600-gallon electric triplex pump.

The smelter, at Clifton, 7 miles from the mines, is designed for five 250-ton water-jacket blast furnances, with 2 installed, of which only one is in steady operation. Above the charging floor are 23 ore bins, each 20x20x16′, with chutes. A 10′ dust-flue leads to a 20x20x100′ dust-chamber, with bottom of hoppers discharging periodically into cars on a railroad track in the tunnel beneath. The fumes pass from this dust-chamber through a 170′ flue to a 150′ steel smokestack. A 60x80′ powerhouse of steel, on stone foundations, houses a 300-h. p. tandem compound condensing engine, direct-connected to blowers with capacity of 3,000 cubic feet of free air per minute. The smelter has a slag-line, with electric locomotive. The briquetting plant for flue-dust and fines has a daily capacity of 60 tons. Product is turned out as 55% matte, but a conversion plant, now badly needed, will doubtless be added shortly.

The company has a general store at the mine and another at the smelter. The smelter was given a trial run, May to September, 1902, and then blown out to await completion of the concentrator. Reduction was begun on Jan. 21, 1903, and production of refined copper in 1903 was approximately 6,250,000 lbs. In addition to its own ores the smelter is treating about 25 tons of very rich ore from the Standard mine daily, on a custom basis.. Operations for the fiscal year ending August 31, 1903, showed a mining and smelting profit of $129,818, or, less interest payments, $88,168 net. Cost of copper is said to be approximately 8.5 cent per lb., and production for 1904 should reach or exceed 12,000,000 lbs. of refined copper. The property has cost about $2,500,000 as it stands, and its stock is widely scattered. The Shannon is not a rich mine, but it has been thoroughly developed and well equipped, and is being made a success by careful and efficient management.

SHASTA COPPER MINING CO. **CALIFORNIA.**

Mine office: Shasta, Shasta Co., Cal.

SHASTA GOLD & COPPER CO. **CALIFORNIA.**

Office: 326 Post St., San Francisco, Cal. Capitalization $500,000, shares $1 par. W. F. Mitchell, president and general manager; W. E. von Johannsen, secretary. Lands, 14 claims, in the Dog Creek district, about 12 miles north of Redding, Shasta Co., Cal. Has 3 gold-bearing quartz veins and 2 copper veins. Claimed to plan installing a mill.

SHASTA MAY BLOSSOM MINING & SMELTING CO. CALIFORNIA.

Office: 713 Market St., San Francisco, Cal. Mine office: Winthrop, Shasta Co., Cal. Organized 1901, under laws of Arizona, with capitalization $1,500,000, shares $1 par. Morton Lindley, president and general manager; S. Peter, secretary; C. H. Davis, superintendent. Lands, 11 claims, area about 200 acres, in the Pittsburg district, showing 3 fissure veins, largest 5′ to 30′ in width, with schistose and porphyritic walls, carrying low-grade auriferous iron-copper sulphides with spar gangue. Is developing by a number of tunnels and has about 1,300′ of underground openings. Added a power plant and 5-stamp mill in 1903. Said to be reorganizing as the Shasta May Blossom Copper Company, Consolidated.

SHAW-GIBSON MINING CO. NEW MEXICO.

Mine office: Lordsburg, Grant Co., N. M.

SHAWMUT MINING CO. UTAH.

Office: Boston, Mass. Mine office: Bingham Canyon, Salt Lake Co., Utah. W. B. Andrew, manager. Company short of funds at last accounts.

SHEEP MOUNTAIN MINING & TUNNEL CO. COLORADO.

Letters returned unclaimed from Crystal, Gunnison Co., Colo.

SHELDEN & COLUMBIAN MINE. MICHIGAN.

Owned by J. H. Rice, et al, Houghton, Mich. Lands, next north of Isle Royale mine. Idle since 1870. Fully described in Volumes I and II.

SHOSHONE MINE. NEW MEXICO.

Office and mine: care of Gusdorf Bros., owners, Amizett, Taos Co., N. M. Ores carry gold and copper. Has water power and 10-stamp mill.

SHRIVER MINE, TEXAS.

Near Llano, Llano Co., Texas. Main shaft, 585′. Idle.

SHUTTLETON MINE. AUSTRALIA.

Mine office: Shuttleton, N. S. W., Australia. Said in July, 1903, to have been recently floated, and to have put a few men at work.

SIBILSKY-CHAPMAN TRACT. MICHIGAN.

An exploration near Calumet, in 4-57-31, Keewenaw county, Michigan.

SIERRA-ALTO COPPER MINING CO.

Letter returned unclaimed from 60 State St., Boston, Mass.

SIERRA DE COBRE MINE. MEXICO.

Office: 99 John St., New York. Mine office: La Cananea, Sonora, Mex. Employs about 300 men. Controlled by Phelps, Dodge & Co. F. L. Harrington, superintendent. Lands, 100 pertenencias, area 247 acres, about 3 miles northwest of the Cananea smelter, and surrounded by holdings of the Greene Consolidated. Title is in the Indiana-Sonora Copper & Mining Co., Phelps, Dodge & Co., holding an option on a portion of the stock issue of this company. Country rocks are quartzite, limestone and porphyry, with a large gossan outcrop showing more or less conglomerate, with 3 veins, of 25′, 100′ and 125′ average widths, carrying low-grade ores, developed by one short tunnel and 5 shafts. Has one gasoline and 4 steam hoists, with assay office, store, boarding-house and dwellings. Present work is largely of an exploratory nature, but the property is regarded as likely to develop into a good mine.

SIERRA MADRE EXPLORATION, LTD. **MEXICO.**

Offices: Throgmorton House, Copthall Ave., London, E. C., Eng. J. K. Pollock, chairman; A. H. Dawbarn, secretary. Capital, nominal, £60,000, shares 25s. par; issued, £40,000. Lands, 200 pertenencias, carrying gold, silver and copper, also rights to 46,000 acres of timber lands, in the Sierra Madre mountains, states of Chihuahua and Sonora, Mexico.

SIERRA MORENA COPPER MINES, LTD. **SPAIN.**

Offices: 2, Basinghall Ave., London, E. C., Eng. Mine office: Penaflor, Sevilla, Spain. J. E. G. Haddath, secretary; R. Stanton, mine manager. Capital, nominal, £80,000; issued, £60,000. Lands include La Preciosa and adjoining mines, near Penaflor.

SIERRA NEVADA MINES. **SPAIN.**

Mine office: Guejar Sierra, Granada, Spain. Owned by a Belgian company. Has argentiferous copper ores.

SIERRA DEL ORO GROUP. **ARIZONA.**

Mine office: Clifton, Graham Co., Ariz. Lands, 15 claims, near the Clifton Consolidated, also a 5-acre millsite on the San Francisco river. Ores carry gold, copper and silver.

SIERRA-PACIFIC SMELTING CO. **MEXICO.**

Office: 440 Temple Court, Minneapolis, Minn. Capitalization, $2,500,000. Lands, 25 acres, somewhere in Sonora, Mexico, said to show silver-copper ores in a 186′ shaft.

SIERRA-SONORA SMELTING CO. **MEXICO.**

Name changed to Sierra-Pacific Smelting Co.

MINAS DE SIERRACILLA DEL TAMUJOSO. **SPAIN.**

Mine office: Puebla de Guzman, Huelva, Spain. C. & J. Sundheim, owners; Wm. Guthrie Bowie, manager, Alosno, Huelva, Spain. Some ore shipments were made by former operators, but ore is complex and requires special treatment. Property idle.

SIERRITA MINING & MILLING CO. **ARIZONA.**

Office: Tucson, Ariz. J. P. Owen, general manager.

SIGNET GOLD & COPPER MINING CO. **UTAH.**

Office: care of E. E. George, secretary, Salt Lake City, Utah. Mine office: American Fork, Utah Co., Utah. C. E. Stewart, president; A. W. Lister, treasurer. Organized November, 1903, under laws of Utah, with capitalization $75,000, shares 25c par. Property is the Signet group of 4 claims, in the American Fork district, on which development was begun with the formation of the company.

SILVER BAR COPPER MINING CO. **NEW MEXICO.**

Property sold to Mogollon Gold & Copper Co.

SILVER CLIFF GOLD & COPPER MINING CO. **MONTANA.**

Mine office: Saltese, Missoula Co., Montana.

SILVER CONNOR MINE. **NEVADA.**

Mine office: Eureka, Eureka Co., Nev. Has blocked out about 50,000 tons of low-grade ore, averaging about $6 in gold and silver, and shipped a little high-grade ore, averaging 27.9% copper, to the Salt Lake smelter, late in 1903.

SILVER CREEK GOLD MINING CO. **WASHINGTON.**

Letter returned unclaimed from former office and mine, Index, Snohomish county, Washington.

SILVER FLAT MINING & MILLING CO, **UTAH.**

Office: care of Abel John Evans, Lehi, Utah. Capitalization, $50,000, shares 10c par. Lands, 5 claims, in the American Fork Canyon, Silver Lake district, carrying auriferous and argentiferous copper and lead ores.

SILVER GLANCE GROUP. **NEW MEXICO.**

Mine office: Chloride, Sierra Co., N. M. Joseph Oliver, superintendent. Ores carry silver, gold and copper.

SILVER HILL MINING CO. **NORTH CAROLINA.**

Mine office: Silver Hill, Davidson Co., N. C. J. M. Prim, superintendent. Ores carry gold, silver, lead, copper and zinc. Has steam power and mill with 5 stamps, crusher and rolls, employing about 40 men.

SILVER KING MINING CO. **UTAH.**

Mine office: Park City, Summit Co., Utah. Hon. Thos. Kearns, general manager; W. J. Dalley, superintendent. Ores carry gold, silver, lead and copper. Has steam power and 250-ton concentrator, employing 300 men. This is one of the famous silver mines of the world, paying monthly dividends of $100,000. The copper values in the property have shown a material increase during the past two years.

SILVER LAKE MINE. **COLORADO.**

Mine office: Silverton, San Juan Co., Colo. Owned by Guggenheim Exploration Co. S. I. Hallett, manager. Ores carry gold, silver, lead and copper and mine is extensively developed. Has steam and electric power and 400-ton concentrator.

SILVER MONUMENT MINE. **NEW MEXICO.**

Mine office: Chloride, Sierra Co., N. M. B. S. Phillips, superintendent. Ores carry silver, gold and copper. Has steam power and a 5-stamp mill.

SILVER MOUNTAIN MINING CO. **COLORADO.**

Mine office: Empire, Clear Creek Co., Colo., M. B. Stewart, manager. Ores carry gold, silver and copper. Has steam power and a small stamp mill, employing about 25 men.

SILVER SPUR MINING CO. **AUSTRALIA.**

Office and mines: Silver Spur, Stanthorpe district, Queensland, Australia. Organized 1898, under laws of Queensland, with capitalization £24,000, shares £1 par, 15s. paid in. Has paid dividends of £18,300. Edgar Hall, secretary and general manager; Richard Prout, mining captain. Lands, 45 acres, showing 4 lenses averaging 8′ in width and 100′ in length, with varying depths, carrying sulphide ores returning 1% copper, 12% lead, 20% zinc, $1 gold and 25 oz. silver per ton. Has 4 shafts, deepest 300′ with about 12,000 tons of ore blocked out for stoping. Has steam plant, including hoist, 5-drill air compressor, crusher, Chilean mill, etc., also a sawmill and smelter, which receives ore by tramline, and has a 42x100″ Austin water-jacket pyritic smelter and reverberatory furnaces. Product is turned out as 33% matte. Employs about 50 men. Copper production for 1902 was 78,000 lbs.

SILVER TIP GOLD MINING CO. WASHINGTON.

Office: Tacoma, Wash. Mine office: Maple Falls, Wash. Chas. P. Topliff, superintendent. Ores carry gold, silver and copper.

SILVERMAN-ALASKA GROUP. ALASKA.

Mine office: care of San Silverman, manager, Ketchikan, Alaska. Said to be organized under laws of New Jersey. Lands, on Prince of Wales Island, Alaska. Is vigorously developing auriferous copper ores.

SILVERSMITH MINE. MONTANA.

Mine office: Basin, Jefferson Co., Mont. T. J. Sweeney, manager. Ores carry gold, silver and copper. Has steam power.

SILVERTON MINING CO. COLORADO.

Mine office: Silverton, San Juan Co., Colo. J. H. Starkweather, superintendent. Lands, on Sultan mountain, include the North Star mine, with ores of gold, silver and copper. Has steam and water power and a 60-stamp mill.

SILVERTON MINING CO. WASHINGTON.

Mine office: Silverton, Snohomish Co., Wash. Is developing a vein carrying gold, silver and copper, near the Bonanza Queen mine.

SIMILKAMEEN COPPER MINES. BRITISH COLUMBIA.

Stuart Armour, president. Capitalization $200,000, shares 10c par. Lands are somewhere in the Similkameen district of British Columbia.

SIMSBURY MINE. CONNECTICUT.

An old, small and idle property, at Granby, Hartford Co., Conn.

SINAÏ MINING SYNDICATE. ARABIA.

Mine office: Mt. Samarah, Arabia, care of G. Beyts & Co., Suez, Egypt. M. Wanner, mine manager. Company is reopening old copper mines, worked by the early dynasties of Egyptian kings, and abandoned probably some 1,500 years before the Rio Tinto was first opened by the Phoenicians a thousand years or so before the birth of Christ.

SINBAD MINE. MONTANA.

Mine office: Butte, Silver Bow Co., Mont. Lands are just north of the Pittsburg & Montana, in East Butte. Has a 600′ shaft. Idle.

SISKIYOU GOLD & COPPER CO. CALIFORNIA.

Office: 326 Post St., San Francisco, Cal. Mine office: Rollins, Siskiyou Co., Cal. Lands, 8 claims, area 160 acres, on the state road between Yreka and Rollins, Siskiyou county.

SISKIYOU GOLD & COPPER MINING CO.

Office: 44 Central Blk., Salt Lake City, Utah.

SISKOWIT MINE. **MICHIGAN.**

Operated 1845-1855, near Rock Harbor, Isle Royale, Michigan, on a 5′ amygdaloid vein carrying sheet copper in contact with walls. Made about 150 tons of copper. Main shaft is about 500′ deep.

MINA LA SIVERIA. **MEXICO.**

Office and mine: Topia, Durango, Mex. E. Torres, owner.

SIX EAGLES MINING CO. **WASHINGTON.**

Office: Olympia, Wash. Mine office: Loomis, Okanogan Co., Wash. Robt. Frost, superintendent. Ores carry gold, silver, lead and copper. Has gasoline power.

SJANGELI MINES. **NORWAY & SWEDEN.**

Mine office: Sjangeli, Norway, Property includes the Sjangeli, Mina Alakats, Valfojokk and Ruopsuokjaure groups, partly in Norway and partly in Sweden. Country rocks are hornblende schists with narrow strata of limestone, and lenticular bodies of massive gabbro, ores occurring in the schists as cuprite, bornite, chalcocite and chalcopyrite, giving assays of 2.5% to 55% copper, with an average assay tenor of about 12.5%. Properties are about 30 miles from the coast, with good water-power available. Statement that mines have gone into hands of an American syndicate is untrue. Property is apparently the most valuable copper proposition remaining undeveloped in the Scandanavian peninsula.

SKOVVASFJELDETS AKTIEBOLAG. **NORWAY.**

Mine office: Harran, Norway. N. Tiskum, manager.

SKYLARK COPPER MINING & SMELTING CO. **UTAH.**

Office: 40 Commercial Blk., Salt Lake City, Utah. Mine office: Blue Acre, Beaver Co., Utah. Organized May, 1899, under laws of Utah, with capitalization $75,000, shares 25c. par. A. J. McMullen, president and general manager; E. A. Cook, secretary and treasurer; Frank Savage, superintendent. Lands, 10 claims, area 200 acres, in the Beaver Lake district, showing a 4′ contact vein between limestone and granite, opened by shafts of 150′ and 365′ and by 6 tunnels, longest 155′, showing chalcopyrite and galena, estimated by company to average 5% copper and 6 oz. silver, from copper ore, and 40% lead, 76 oz. silver and $2.50 gold per ton, from the lead ore.

SLATE CREEK MINING CO. **ARIZONA.**

Mine office: Prescott, Yavapai Co., Ariz. Percy Williams, manager. Operates the Blue Dick mine, producing gold, silver, lead and copper. Has electric and gasoline power and a 50-ton smelter.

SLATE CREEK MINING & MILLING CO. **WYOMING.**

Office: Wheatland, Wyo. M. F. Montgomery, superintendent.

SLATER COPPER MINES CO. **MISSOURI.**

Office: Willow Springs, Mo. Lands are in Shannon Co., Mo. Idle.

SMELTING & REFINING CO. OF AUSTRALIA (1901) LTD. **AUSTRALIA.**

Offices: 120, Bishopsgate St., London, E. C., England. Works office: Dapto, New South Wales, Australia. Sir T. Salter Pyne, chairman; W. L.

Hoyt, general manager; E. J. Rogers, superintendent; C. J. Pryer, acting secretary. Capital, nominal, £650,000; issued, £507,111. Debentures, £100,000 at 5%. Property is 300 acres, freehold, improved by a smelting and refining plant and sulphuric acid works, a 2.5-mile private railroad and a controlling interest in Webb's mine. Smelter has a daily capacity of about 400 tons, and further increase is contemplated.

SMOKEHOUSE MINING CO. **MONTANA.**

Office and mine: Butte, Silver Bow Co., Mont. Bernard Noon, general manager. Has steam power and 500′ two-compartment shaft.

SNOHOMISH & TRAMWAY MINES. **MONTANA.**

Mine office: Butte, Silver Bow Co., Mont. John S. Harris, receiver. Idle, owing to three-cornered litigation between F. A. Heinze, Clara Larkin and the Amalgamated Copper Co.

SNOWBIRD COPPER MINING CO. **MONTANA.**

Office: Butte, Silver Bow Co., Mont. Lands are in dispute between the Montana Ore Purchasing Co. and the Anaconda Copper Co.

SNOWSHOE COPPER MINING CO. **MONTANA.**

Has copper claims somewhere in Montana.

SNOWSHOE GOLD & COPPER MINES, LTD. **BRITISH COLUMBIA.**

Offices: 7, Poultry, London, E. C., Eng. Mine office: Phœnix, B. C. Employs 65 men. Earl of Chesterfield, chairman; Geo. S. Waterlow, D. L., J. P., vice-chairman; Thos. J. Morris, secretary; Anthony J. McMillan, managing director; J. W. Astley, superintendent; J. H. Trevorrow, mining captain. Organized Jan. 20, 1901, under laws of United Kingdom, with capitalization £250,000, shares £1 par; issued, £198,105. Lands, 4 claims, area 120 acres, freehold, about ¼ mile from the Granby, in the Grand Forks division of the Yale and Cariboo district. Ore occurs in fissure replacements running 25′ to 200′ wide, with an average of about 100′ width, and 1,000′ length. Ore occurs occasionally in distinct bodies, somewhat mixed, but is mainly disseminated in minute particles throughout a gangue varying from silicious to calcareous, and carrying occasional magnetite and specular hematite. Ore is exclusively self-fluxing chalcopyrite, apparently well adapted to oil concentration. Experiments in electrolytic reduction conducted on this ore by Thos. A. Edison do not seem to have resulted successfully.

Mine has tunnels of 200′, 250′ and 600′, and shafts of 200′ and 300′, the main shaft having 3 compartments, with a 150-h. p. double-drum electric hoist, raising 2-ton skips, but bulk of production is secured from open-cast workings. Machinery plant includes a 30-drill Rand Corliss cross-compound condensing steam and compound air compressor. Production was 20,000 tons of ore in 1902, and 74,000 tons in 1903, mined at an average cost of $1.10 per ton. Ore is shipped to smelters at Greenwood and Boundary Falls for reduction, mine having direct rail connection with the Canadian Pacific line. Merging of the Snowshoe with the British Columbia Copper Co. has been under consideration for some time. The property seems to have a careful and capable management, and though very low in grade, the ore body is of tremendous size, and should make a good mine if worked on a considerable scale.

SNOWSTORM GOLD & SILVER MINING & MILLING CO. COLORADO.

Mine office: Durango, La Plata Co., Colo., J. E. Downer, manager. Ores carry gold, silver, copper and mercury. Has water power and a 10-stamp mill.

SNOWSTORM MINING CO. IDAHO.

Mine office: Mullan, Shoshone Co., Idaho. J. B. Kiefer, superintendent. Ores carry copper, gold and silver. Has water power and has secured considerable underground development.

SOCORRO GOLD MINING CO. ARIZONA.

Mine office: Harrisburg, Yuma Co., Ariz. J. Wetherley, manager. Ores carry gold, silver and copper. Has steam power.

SOLACE COPPER MINING CO. ARIZONA.

Office and mine: Globe, Gila Co., Ariz. Ignatius Schlinger, president; W. P. Morey, secretary. Capitalization $5,000,000, shares $1 par. Lands, 5 claims, near the Bloody Tank mine, 8 miles from Globe.

MINA SOLEDAD Y ANEXAS. MEXICO.

Mine office: Ameca, Jalisco, Mex. Chris. O'Brien, manager.

SOLOMON SPRINGS COPPER MINING CO. ARIZONA.

Property under bond and lease to Houghton County Development Co.

SONGATOF MINE. RUSSIA.

A small producer in the Altai, Russia.

SONOMA MINES OF MEXICO, LTD. MEXICO.

Offices: 4, Great Winchester St., London, E. C., Eng. Mine office: Avino, Durango, Mex. G. H. Johnson, secretary; W. B. Jeffrey, general manager; E. L. Wagner, superintendent. Capital, nominal, £500,000; issued, £450,007. Lands, 441 acres, carrying ores of gold, silver and copper, the Sonoma claims showing an ore body averaging 2.5% to 4% copper, with fair gold and silver values. Has steam power and employs a considerable force.

SONORA COPPER COMPANY OF MEXICO. MEXICO.

Assets, consisting of a lawsuit, sold to Puertecito Copper Co.

SONORA DEVELOPMENT CO. MEXICO.

Office: 603 New Ridge Bldg., Kansas City, Mo. Mine office: Moctezuma, Sonora, Mex. Organized under laws of Arizona, with capitalization $1,000,000. Wm. Huttig, president; John W. Amerman, secretary; Jas. E. Lawrence, engineer. Lands, 98 pertenencias, area about 240 acres, including the Don Genaro y Anexas, Nacozari Copper Queen, Wostenholm, Conforme, Goodlander, Santa Clara, Cuahtumoc and La Verde groups. The Nacozari Copper Queen, area about 65 acres, lies between the Nacosari and Belle Union mines of the Moctezuma Copper Co., giving ore assaying up to 58% copper. Company has secured considerable development by shafts and tunnels on sundry copper, silver and gold properties, and employs 75 to 100 men. Property regarded as valuable.

SONORA MINING CO. **MEXICO.**

Office: 405 Post Bldg., Battle Creek, Mich. Organized under laws of Wyoming, with capitalization $2,000,000, shares $1 par. J. C. Barber, president; H. A. Clapp, secretary and general manager. Lands, 111 pertenencias, area 275 acres, in the Alamos district of Sonora, shows ores giving assays up to 14% copper and 40 oz. silver per ton.

SONORA MINING & MILLING CO. **MEXICO.**

Mine office: Tubutama, Sonora, Mex. Organized under laws of Arizona, with capitalization $1,000,000, shares $1 par. Con. O'Keefe, president and general manager; Robt. McKinnon, secretary. Lands, 320 pertenencias, area about 800 acres, developed by 250′ main shaft. Property includes 3 groups, the Penasco, Cobrecita and Fortuna, former said to show about 400,000 tons of $15 ore. The Cobrecita, or Mina Grande, shows a very strong vein, running up to 200′ in width and traceable nearly a mile, developed by 2 shafts. Employs about 100 men, and has steam power and good mining equipment, also a general store, and a Vulcan smelter which is said to be giving good results. Water, which is scarce, is stored in a reservoir. Management is in the hands of mining men of experience and good standing, and the property is regarded as valuable.

JOSE SOSSI. **BOLIVIA.**

Office and mine: Coro Coro, La Paz, Bolivia. A small operator, having a mine equipped with steam power and employing about 30 men.

COMPANHIA MINEIRA DE SOTIEL CORONADA. **SPAIN.**

Office: Lisbon, Portugal. Mine office: Calañas, Huelva, Spain. Lands, 6,666 hectares, including 34 mine openings. Production in 1899 was 795 long tons of refined copper.

SOCIEDAD ANONIMA DE SOTO. **SPAIN.**

Office: Bilbao, Spain. Mine office: Reinosa, Santander, Spain.

SOUTH AFRICAN COPPER ESTATES, LTD. **CAPE COLONY.**

Offices: 124, Chancery Lane, London, W. C., Eng. F. W. H. Durant, secretary. Capital, nominal, £5,000; issued, £557. Lands are in Namaqualand, Cape Colony, South Africa.

SOUTH AFRICAN GOLD & COPPER MINING SYNDICATE, LTD.

Offices: 54, Gresham St., London, E. C., Eng. Registered November 24, 1903, with capitalization £15,000. E. G. Knight, J. W. H. Barr, F. Gartside and F. Moore, directors.

SOUTH AMERICAN DEVELOPMENT CO. **PERU.**

Succeeded by Cerro de Pasco Mining Co.

SOUTH AUSTRALIAN COPPER SYNDICATE, LTD.

Offices: 13, St. Helen's Pl., London, E. C., Eng. Never did business.

SOUTH BISBEE COPPER MINING & TOWNSITE IMPROVEMENT CO. **ARIZONA.**

Office: 104 Stimson Blk., Los Angeles, Cal. Lands are under bond and lease to Lake Superior & Pittsburg Development Co., and shareholders are in litigation over division of $150,000 received on account, and will fight even more fiercely over $1,050,000 cash to be paid company in June, 1904.

SOUTH KEARSARGE MINE. **MICHIGAN.**

Owned and operated by the Osceola Consolidated Mining Co.

SOUTH MOUNT LYELL MINING CO., LTD. **TASMANIA.**

Offices: 153, Leadenhall St., London, E. C., Eng., and 320, Collins St., Melbourne, Victoria, Australia. Mine office: Gormanston, Montague Co., Tasmania. J. P. Lonergan, chairman; G. Moore, acting chairman; H. M. Taylor, secretary in London; N. Madden, secretary in Melbourne; J. Ryan, mine manager. Capital, nominal, £600,000; issued, £496,150, shares £2 par, non-assessable. Lands, 93 acres on Mt. Lyell and 80 acres on Mt. Darwin, former carrying 4% to 6% sulphide ore. Has shafts of 90′ and 718′ and 703′ main tunnel. Idle since June 1, 1903.

SOUTH PEACOCK MINE. **IDAHO.**

Office: 88 State St., Boston, Mass. Mine office: Weiser, Washington Co., Idaho. Capitalization $500,000. Thos. S. Wentworth, president; Wm. L. Pratt, secretary. Lands are in the Seven Devils district. Idle.

SOUTH RANGE MINING CO. **MICHIGAN.**

Office: 60 State St., Boston, Mass. Mine office: Houghton, Houghton Co., Mich. R. R. Goodell, president; H. W. Wesson, treasurer; F. W. Nichols, secretary. Capitalization $2,500,000, shares $25 par. Lands are about 7,000 acres, lying mainly between the Globe and Belt properties, in Houghton and Ontonagon counties, Michigan.

SOUTH SIDE MINING CO, **MICHIGAN.**

Office: care of John C. Watson, 68 Devonshire St., Boston, Mass. Lands, 200 acres, west of the Dacotah and north of the Naumkeag, with ½ mile frontage of Portage Lake, west of Houghton, Houghton county, Michigan.

SOUTH THARSIS MINE. **TASMANIA.**

Sold to Mt. Lyell Mining & Railway Co., Ltd.

SOUTH WHEAL CROFTY CO. **ENGLAND.**

Offices: Carn Brea, R. S. O., Eng. Mine office: Illogan, Cornwall, Eng. F. Harvey, chairman; J. Penhall, manager; C. H. Paull, purser. Is operated on the cost-book plan. Has tin and copper mines, equipped with a mill having 60 stamps and 14 vanners.

SOUTHERN STAR COPPER & SMELTING CO.

Letter returned unclaimed from former office in New York.

SOUTHERN ZINC & COPPER CO. **ARKANSAS.**

Office: 708 University Ave., Rochester, N. Y. Mine office: Gillham, Sevier Co., Ark. Employs 18 men. Organized May 3, 1900, under laws of Arkansas, with capitalization $2,000,000, shares $100 par. E. J. Morley, president; E. S. Osborne, assistant secretary and general manager. Lands, 700 acres, in the Gillham district. Company is developing zinc property only, at present.

SOUTHERN PACIFIC GOLD & COPPER MINING CO. **UTAH.**

Office: care of J. W. Burnham, secretary and general manager, Salt Lake City, Utah. Capitalization $300,000, shares 50c. par. Is developing a property in the Sierra Nevada district of Box Elder county, Utah, said to show a vein of high-grade copper ore.

SOUTHWEST AFRICA CO. **DAMARALAND.**

Offices: 3, Laurence Pountney Hill, London, E. C., Eng., and Unter den Linden 35, Berlin, Germany. G. Cawston, chairman. Capital, nominal, £2,000,000; issued, £1,000,000. Lands, mineral concessions over 22,000 square miles, including nearly 4,500 square miles of freehold in Damaraland, and mining rights over 23,000 square miles in Ovamboland; total holdings include 40,000 square miles of freehold, with mining rights over 90,000 square miles additional, also sundry railroad concessions. It is planned to build a railway to reach the very promising copper deposits on this company's holdings in Damaraland.

SOUTHWESTERN COPPER & IRON CO. **NEW MEXICO.**

Mine office: Santa Rita, Grant Co., N. M. Under lease to Thos. Carter. Lands, 15 claims, in the Burro Mountains, from which $100,000 worth of copper was produced, 1900-1901.

SOUTHWESTERN MINE & SMELTING CO. **ARIZONA.**

Office: Gleeson, Cochise Co., Ariz. W. R. Fagan, El Paso, Tex., manager. Organized 1903, to build a custom smelter at Gleeson.

SOUTHWESTERN SMELTING CO, **CALIFORNIA.**

Letter returned from works office, Oro Grande, San Bernardino Co., Cal. Supposed to have bought the 80-ton water-jacket smelter of the Davis Mining & Smelting Co., about July, 1903.

SOVEREIGN COPPER MINING CO. **WYOMING.**

Letter returned unclaimed from Battle, Carbon Co., Wyo.

J. SOWELL & CO. **OREGON.**

Mine office: Althouse, Josephine Co., Ore.

SPANISH COPPER CO., LTD. **SPAIN.**

Offices: 2, Tokenhouse Bldgs., London, E. C., Eng. Mine office: San Vicente, via Paimogo, Huelva, Spain. Capital, nominal, £150,000; issued, £94,260. Chas. A. de Mancha, chairman; Wm. H. Nash and Miguel Yglesias, directors. Lands, 6 claims, area 200 acres, perpetual leasehold, also 23 acres miscellaneous lands, in the Paimogo district of Huelva, showing 6 contact veins between porphyry and clay-slate, of which 3 are being developed, these averaging 30′ width and 500′ length, opened by numerous shafts of 30′ to 100′ depth and 14 tunnels, longest 1,840′, estimated to show 2,500,000 tons of ore, with 100,000 tons blocked out for stoping. Ore is mainly cupriferous pyrites, averaging about 4% copper, 3 oz. silver and $2 gold per ton. Annual rental, £400. Mines were first opened by the Phœnicians, reopened 1862, and again in 1901. The Gaudina railroad is 5 miles distant. Property is idle, except for a few men engaged in making cement copper from the mine waters.

SPANISH MINERALS DEVELOPMENT, LTD. **SPAIN.**

Offices: 157, Cannon St., London, E. C.. Eng. Mine office: Almonaster, Huelva, Spain. J. B. White, chairman; A. Thomas, mine manager; W. E. Hopper, secretary. Capital, £100,000. Lands, 476 acres, including the Esperanza, Forzosa and other mines, undergoing development.

SPARONE MINES. **ITALY.**

A group of small producers, in Piedemont, Italy.

SPECULATOR MINING CO. **MONTANA.**

Office and mine: Butte, Silver Bow Co., Mont. Employs about 300 men. John A. Creighton, president; John Dougherty, secretary and general manager; W. W. Wilson, superintendent. Property has been the subject of extended litigation, which was decided May 2, 1903, in favor of present company. Mine is developed by a 1,600′ 3-compartment main shaft, sunk in granite and connected with ore bodies by crosscuts, with several winzes, which are practically blind shafts, equipped with cages and 5x8″ double cylinder hoist, run by compressed air. Is connected underground with the High Ore, Diamond and Bell mines. Shaft has an 80′ steel gallows-frame. Ores average 3% to 5% copper. Surface improvements include a brick and steel boiler and engine house, with four 150-h. p. boilers and a large air compressor, also a machine shop, smithy, carpenter shop and assay office. Ore is treated at the Washoe, Butte & Boston and Colorado smelters. For the year ending June 1, 1903, the mine produced 29,233 tons of ore, giving gross returns of $15.03 per ton, with net proceeds of $106,783.84. Since adjudication of title production has been largely increased, and is now perhaps 400 tons of ore daily. Property, while small, has a large amount of medium-grade ore, and is capable of a considerable production at a fair profit.

SPENCE GROUP. **OREGON.**

Office and mine: care of Dr. J. Spence, secretary and general manager, Kerby, Josephine Co., Ore. Employs 3 men. Lands, 8 claims, area 160 acres, having a 60′ shaft and 4 tunnels, longest 700′, with about 1,250′ of underground openings, showing 3 veins, ranging 3′ to 100′ in width, carrying 2% to 60% copper, with fair gold and silver values, in cuprite, malachite, azurite and chalcopyrite. Management plans continuing a 200′ tunnel 1,200′ further, to crosscut 4 other veins, and plans developing the mines thoroughly and conservatively before erecting reduction works.

SPENCE MINERAL CO. **CALIFORNIA.**

Office: San Francisco, Cal. Mine office: Spenceville, Nevada Co., Cal. Chas. W. Howard, Jr., general manager. Is one of the oldest mines in the state, operating quite steadily since 1875. Ores are auriferous and argentiferous sulphides, averaging about 5% copper and 45% to 50% sulphur, occurring in wide irregular fissures near the contact of diorite and grano-diorite. Main shaft caved in, during 1903.

SPOKANE MINE. **WASHINGTON.**

Mine office: Twisp, Wash. Ores carry gold, silver and copper. Has water power and a 10-stamp mill.

SPOKANE COPPER CO. **WASHINGTON.**

Letter returned unclaimed from Cle Elum, Kittitas Co., Wash.

SPRING GULCH GOLD MINING CO. **COLORADO.**

Mine office: Idaho Springs, Clear Creek Co., Colo. J. B. MacFarlane, superintendent. Operates the Banty group, carrying gold, silver, lead and copper. Has gasoline power.

SPRINGDALE COPPER MINING CO. **OREGON.**

Mine office: Athena, Umatilla Co., Oregon.

SPRINGFIELD MINE. **MARYLAND.**

An old and idle property in Carroll county, Maryland.

SPRINGFIELD GOLD & COPPER MINING CO., LTD. **IDAHO.**

Office and mine: 720 Bank St., Wallace, Shoshone Co., Idaho. Capitalization $100,000, shares 10c. par. Wm. Lively, president; D. A. McKenzie, vice-president and manager; Jos. T. Whelan, secretary. Lands, 4 patented claims, area 80 acres, well timbered, in the St. Joe district, showing 2 fissure veins, opened by about 1,100′ of tunnels, longest 860′ showing a 13′ vein of ore carrying estimated values of $22 per ton.

SPRINGFIELD-MEXICAN MINING CO. **MEXICO.**

Office: 213½ South Sixth St., Springfield, Ill. Mine office: Union de Tula, Jalisco, Mex. Employs 30 men. Geo. F. Stericker, president; Geo. M. Morgan, vice-president and general manager; E. A. Walsh, secretary; Chas. H. Hereford, superintendent; Arthur Hay, engineer. Organized June 3, 1903, under laws of Arizona, with capitalization $500,000, shares $1 par. Lands, 16 pertenencias, area about 40 acres, in the Ameca district. Veins are 3 fissures in porphyry, of which one, averaging 4′ width, is developed by shafts of 60′, 85′ and 160′ and by tunnels of 55′, 110′, and 174′, giving ore assaying 11% copper and 10 oz. silver per ton, with traces of gold. Property is an antigua, closed 1821 and reopened 1901. Has shipped at little high-grade ore to the National Metal Co. at Guadalajara and Ameca.

STAATBERGER HÜTTE A.-G. **GERMANY.**

Mine office: Niedermarsberg, Westfalen, Germany. Said to secure an annual production of about 800 tons of refined copper.

STANDARD CONSOLIDATED COPPER CO. **ARIZONA.**

Office: 10 P. O. Sq., Boston, Mass. Mine office: Clifton, Graham Co., Ariz. Organized 1903, under laws of Maine, with capitalization $1,500,000, shares $10 par. C. A. Ross, president; Geo. C. Gill, vice-president; J. W. Hazen, treasurer; John K. Erskine, Jr., secretary. Company was formed to effect the consolidation of the Coronado Mining Co., Standard Copper Mines, and San Jose Mines, all small properties located near Clifton, with considerable ore bodies developed, and with prospects of becoming important producers.

STANDARD CONSOLIDATED MINES CO. **OREGON.**

Office: care of Z. C. Hauser, secretary and general manager, Echo, Ore. Mine office: John Day, Grant Co., Ore. T. C. Taylor, president. Ores carry copper, gold, silver and cobalt, Has steam power and half-interest in a 25-ton smelter. Has about 4,000′ of underground openings and contemplates erection of stamp-mill and concentrator.

STANDARD COPPER CO. **ARIZONA.**

Said to have 7 claims, 13 miles from Casa Grande, Pinal county, Arizona.

STANDARD COPPER MINES. **ARIZONA.**

Offices: Swan House, Copthall Ave., London, E. C., Eng. Mine office: Clifton, Graham Co., Ariz. Employs 40 men. Organized April, 1901, under laws of Arizona, with capitalization $500,000, shares $1 par. Chas. A. Ross, president; A. S. Rosecrans, manager; C. P. Rosecrans, secretary and treasurer; Col. D. C. Casey, superintendent. Lands, 105 acres, near Metcalf, 6 miles from Clifton. Suits to invalidate titles were settled in company's favor late in 1903. Ores are the richest produced in commercial quantities in Arizona, and are all of smelting grade. Practically the entire production is from surface workings. Ore is carried from the mine to the Coronado railroad by a 3,200′ Leschen aerial tram with a drop of 800′, operated by gravity, which transports ore at a cost of about 5 cents per ton, as against a former cost of about $2 per ton, when shipped by burros. Tram-line has shipping bins at the lower terminus, opposite the railroad track. The mine uses gasoline power, machinery equipment being small, owing to open nature of workings.

The mine began production early in 1902, and from May 1 to May 22, 1903, shipped 306 tons of ore, averaging 28% copper, and at close of year was shipping about 25 tons of high-grade ore, daily, to the Shannon smelter. Production of refined copper in 1903 was probably about 1,000,000 lbs. Company paid three dividends in 1903, aggregating 22½%. At close of year it was planned to reorganize under title of Standard Copper Co., and to absorb the Coronado and San Jose mines, with Chas. A. Ross as president of the new company.

While the development of the Standard mines is very slight, being confined almost entirely to limited surface workings, the phenomenally rich ore found renders the property of exceptional promise, and it would be contrary to all accepted rules were the mines not to develop large and profitable ore bodies in the sulphide zone.

STANDARD COPPER MINING CO. **WYOMING.**

Office: supposed to be in Toledo, Ohio, with claims in Wyoming. Chas. P. Waldorf, president.

STANDARD GOLD & COPPER MINING CO. **OREGON.**

Absorbed by Standard Consolidated Mines Co.

STAR CONSOLIDATED MINING CO. **UTAH.**

Mine office: Eureka, Juab Co., Utah. Ores carry gold, silver and copper. Has steam power and employs about 40 men.

STAR COPPER MINING CO. **MICHIGAN.**

Lands, 720 acres in Sections 9-10-16, 58-28, Keewenaw county, Michigan.

STARLIGHT MINE. **ARIZONA.**

Mine office: San Carlos, Gila Co., Ariz. W. J. Nicholson, superintendent.

STARLUS COPPER-GOLD MINING CO.

Letter returned unclaimed from former office in Chicago.

STATE LINE COPPER MINING CO. **WYOMING.**

Office: 300 Century Bldg., Denver, Colo. Employs 6 men. Organized under laws of Wyoming, with capitalization $75,000, shares 5 cents par. C. B. Ayres, president; W. W. Wemott, secretary and treasurer; J. B. Drew, superintendent. Lands, 17 claims, area 340 acres, in the Upper Platte district showing 4 fissure veins, of which two, under development, range from 2′ to 40′ in width. Has 17 pits and shafts of 10′ to 60′ depth.

STAUFFER CHEMICAL CO. **CALIFORNIA.**

Office: San Franciso, Cal. Property is 80 acres, known as the Alma mine, near Oakland, Alameda Co., Cal., developed mainly by tunnels. Ore bodies occur as lenses, between serpentine and metamorphosed chert, in a belt traced 3,000′ Ore is chalcopyrite, ranging 1.5% to 3.5% copper, up to 50% sulphur and about $2.50 gold per ton. After burning for sulphur the cinder is leached for copper.

STEAMBOAT MINING CO. **UTAH.**

Mine office: Brighton, Salt Lake Co., Utah. Is developing by tunnel.

STEPHENS CLAIMS. **MONTANA.**

Office and mine: care of W. J. Stephens, owner, Higgins Blk., Missoula, Missoula Co., Mont. Idle. Lands, 7 patented claims, area 132 acres, also 320 acres miscellaneous lands, in the Wallace district, showing a 45′ vein of concentrating ore and a 30″ vein of sulphide shipping ore, latter giving smelter returns of 13% copper, 28 oz. silver and $5.50 gold per ton. Has shafts of 55′ and 149′, also tunnels of 45′, 105′, 525′ and 928′, with about 2,000′ of underground openings, estimated by owner to show about 100,000 tons of ore.

STEPHENSON-BENNETT CONSOLIDATED MINING CO. **NEW MEXICO.**

Mine office: Organ, Donna Ana Co., N. M. Ores carry silver, lead and copper. Has steam power and a 50-ton concentrator.

STEPTOE MINING CO. **NEVADA.**

Property sold to New York & Nevada Copper Co., September 4, 1902.

STERLING COPPER CO. **ARIZONA.**

Letter returned unclaimed from former office, 44 Broadway, New York.

STEVENS COPPER CO. **ARIZONA.**

Office: Bridgeport, Conn. Mine office: Clifton, Graham Co., Ariz. Henry Setzer, president; Fred Enos, secretary; Chas. E. Stevens, superintendent; F. A. Alsdorf, consulting engineer. Is developed by shaft and tunnel, and shipped a little ore to the Arizona Copper Company's smelter at Clifton, in 1903.

STEVENS PEAK COPPER MINING CO. **IDAHO.**

Office: care of A. M. Strode, president and manager, Mullan, Idaho.

STILLAGUAMISH & SULTAN MINING CO. **WASHINGTON.**

Office: 606 Bailey Bldg., Seattle, Wash. Mine office: Silverton, Snohomish Co., Wash. Idle. Organized September 22, 1892, under laws of Washington, with capitalization $3,000,000, shares $50 par. Richard Sykes, president; J. W. Clise, vice-president and general manager; Willis B. Herr, secretary. Lands, 15 claims, area 575 acres, in the Stillaguamish district, with 1,400′ of mine openings, showing low-grade auriferous copper ore.

STILLMAN COPPER MINING CO. **WYOMING.**

Office: 408-145 La Salle St., Chicago, Ill. Lands are in the Encampment district of Carbon county, Wyoming.

STOBIE MINING CO. **ONTARIO.**

Office: Sault Ste Marie, Ont. Mine office: Desbarats, Algoma, Ont.

Organized 1900, under laws of Ontario, with capitalization $1,000,000, shares $1 par. James Stobie, president; A. B. Upton, vice-president and general manager; John Lear, secretary and treasurer. Lands, 134 acres, in Block O, Johnson Twp., Algoma, Ont., showing a vein of 3′ to 5′ carrying chalcocite, bornite and chalcopyrite. A carload of ore gave net smelter returns of 18% copper in 1901.

STOCKTON COPPER MINING CO. **CALIFORNIA.**

Has a mine carrying auriferous copper ores, in the Burney Valley, near Pitt river, Shasta county, California, and plans installing an experimental 10-ton smelter.

STOCKTON COPPER MINING CO. **COLORADO.**

Office: 312 Bank of Commerce Bldg., Minneapolis, Minn. Mine office: Salida, Chaffee Co., Colo. C. T. Bergh, president; J. W. Allan, secretary; A. E. Chilson, manager, Webster, S. D.; Wm. Parker, superintendent. Development is by a 225′ tunnel, giving a good showing of carbonate ore, with occasional native copper.

STOCKTON COPPER MINING CO. **MONTANA.**

Mine office: Radersburg, Broadwater Co., Mont. Organized under laws of Montana, with capitalization $1,000,000. E. W. Harney, president; P. A. Gamer, secretary; John Rathfus, superintendent. Lands include the Idaho claims, in East Butte, and the North Star group, in Broadwater county, the latter having been a limited producer in the past. Property is considered of value, but company financially embarassed.

STODDARD COPPER CO. **ARIZONA.**

Office: 25 Broad St., New York. Mine office: Stoddard, Yavapai Co., Ariz. Organized under laws of Arizona, with capitalization $5,000,000, shares $5 par. Robt. J. Campbell, president; John N. Drake, secretary; Isaac T. Stoddard, general manager; John Martin, superintendent. Lands, 16 claims, developed by sundry shafts, deepest 250′ in the Copper Bottom mine, also various tunnels, longest 1,000′. Has secured returns of $15 to $26.50 per ton from smelter shipments. Has a concentrator, Huntington mill and 50-ton smelter on the Agua Fria river. Good carbonate and oxide surface ores were succeeded by a leached zone, but fair-grade sulphide ores have been secured at depth.

STONE CREEK COPPER MINING & MILLING CO. **MONTANA.**

Office: 818-109 Randolph St., Chicago, Ill. Mine office: Dillon, Beaverhead Co., Mont. Organized 1901, under laws of Arizona, with capitalization $1,250,000, shares $1 par. G. J. M. Porter, president; B. J. Soper, secretary; W. D. Porter, superintendent; A. L. Stone, agent. Lands, 8 claims, area 125 acres, in the Stone Creek district, showing malachite, azurite and low-grade copper outcrops. Has a 60′ two-compartment main shaft and 5 shallow pits, also a 130′ tunnel.

STONE HILL COPPER MINES. **ALABAMA.**

An idle property, once worked extensively, at Cleburne, Alabama.

STONEWALL COPPER CO. **ARIZONA.**

A swindle, perpetrated by the notorious Wernse gang.

SANTIAGO STOPELLI. **MEXICO.**

Mine office: Jiminez, Chihuahua, Mexico.

STORA KOPPARBERG BERSLAGS AKTIEBOLAG. **SWEDEN.**

Office, mines and works: Falun, Dalarne, Sweden. Capitalization, 9,600,000 kroner, shares 1,000 kroner par. E. J. Ljungberg, director; Lars Yngström, assistant director and general manager. Th. Witt, mining engineer; K. A. Akerblom, superintendent of leaching plant. Lands, 5 claims, 3 patented and 2 unpatented, area 43 hectares. Mine was worked as early as A. D. 1288 and presumably earlier, oldest privileges of the present company being dated Feb. 24, 1347. Company conducts extensive industrial operations, owning and operating iron and steel plants, a paper mill, pulp mill, sawmill, etc., in addition to its copper mines and smelters. Has a number of lenses of ore, largest being an immense mass. Has several mines and many ore bodies, principal being the Storrgrufa, 370 metres long by 220 metres wide and about 320 metres deep, mostly mined out, leaving an open pit about 220′ deep. Ore is chalcopyrite, containing selenium and bismuth, giving average returns of 2.7% to 3% copper, 10 to 15 grams silver and 2.5 to 3 grams gold per ton. Has 14 shafts, with aggregate depth of 1,800 metres, deepest being 343 metres, with about 33 kilometres of tunnels, Has water power. The copper mine employs about 100 men and gives a yearly production of about 43,000 tons of raw ore, which, after hand-cobbing, yields about 14,000 tons of leaching ore. The roasting stalls are one-half kilometre from the mine, and the leaching plant is one-half kilometre beyond the furnaces, all connected by tram-line.

The roasted ore is crushed with salt, re-roasted and leached with dilute sulphuric acid in tanks, the metallic contents of the leach-water being precipitated on scrap iron as cement copper, which is dissolved in sulphuric acid and turned out as bluestone. Annual production is about 1,250 metric tons of sulphate of copper, equal to about 300 tons of fine copper, 80 kilograms of gold and 300 kilograms of silver.

STORRGRUFA MINE. **SWEDEN.**

See Stora Kopparberg Berslags Aktiebolag.

STOWELL MINE. **CALIFORNIA.**

Office: care of J. H. Stowell, owner, Copley, Shasta Co., Cal. Sometimes known as Webster Consolidated. Lands, 10 claims, with a 600′ crosscut tunnel.

STRATHCONA MINE. **ONTARIO.**

Office: care of J. F. Black, owner, Sudbury, Algoma, Ont. Lands are in Levack Twp., showing copper-nickel sulphides, slightly developed.

STRICKLEY-MONTEZUMA MINING CO. **UTAH.**

Mine office: Bingham Canyon, Salt Lake Co., Utah. W. J. Strickley, superintendent. Has auriferous copper ores, and steam power.

STRONG COPPER CLAIMS CO. **OREGON.**

Lands sold to Waldo Smelting & Mining Co.

STRONG COPPER MINING CO. **WYOMING.**

Office and mine: Laramie, Albany Co., Wyo. Employs 15 men.

Organized June 12, 1903, under laws of Wyoming, with capitalization $1,000,000, shares $1 par. N. E. Corthell, president; I. R. Swigart, secretary, treasurer and general manager; E. P. Baker, mine superintendent. Lands, 12 claims, area 170 acres, in Section 4, Town 16, Range 71, Wyoming, showing a fissure vein in pegmatite and contact veins between granite and limestone, of which one, with average width of 4′, is opened by a 170′ shaft and 3 short tunnels, longest 45′, giving average assays of 5% copper, 3.5 oz. silver and $4 gold per ton, from malachite, chalcocite, bornite and chalcopyrite. Has a 40-h. p. steam hoist.

DAVID A. STUART. PERU.

Office and mine: Quicachaca, Yauyos, Peru. Is a small producer of copper, silver, lead and coal.

SUCCESS COPPER MINING CO. ARIZONA.

Office: 536 Douglas Bldg., Los Angeles, Cal. Mine office: Quartzite, Yuma Co., Ariz. Employs 10 men. Organized 1902, under laws of Arizona, with capitalization $750,000, shares $1 par. Chas. E. Eichelberger, president; Robert Marsh, secretary and treasurer; John A. River, superintendent. Lands, 6 claims, area 124 acres, in the Plomosa district, showing 5 contact veins, of which 2 have average widths of 12′, carrying oxide and carbonate ores giving average assays of 15% copper, 40 oz. silver and $3 gold per ton. Has shafts of 60′, 75′, 115′, and 250′, also 300′ tunnel, with 1,700′ of underground openings. Has steam power and contemplates installing a 50-ton smelter.

SUGAR PINE MINE. OREGON.

Office: care of G. N. Bolt, owner, Galice, Josephine Co., Ore. Ores carry gold, silver, copper and lead. Has water and gasoline power and a 4-stamp mill.

SUGARLOAF MINING CO. SOUTH DAKOTA.

Mine office: Custer, Custer Co., S. D. Said to be controlled by Drake, Barnes & Co., Cleveland, Ohio. Has shipped some ore to the Deadwood smelter, from the Richard Palmer mine.

SULITELMA AKTIEBOLAG. NORWAY.

Office: Helsingborg, Sweden. Mine office: Sulitjelma, Nordland, Norway. Employs about 1,000 men. Organized 1890, under laws of Sweden, with capitalization 3,000,000 kroner, shares 500 kroner par, fully paid. Paid dividends of 10% in 1899 and in 1900 and 6% in 1901. Lord-Lieutenant G. Tornerhjelm, president; Consul Nils Persson, vice-president and general manager; Sture P. Henning, assistant general manager; preceding officers, C. Ingelsson, August Sylvan, Thure Röing, P. M. B. Schjölberg, C. E. Hedström, Prof. Hjalmar Sjögren and E. Knudsen, directors. Lands, about 100,000 acres, in the Skjerstad district, lying north of the Arctic circle, and including the Sulitelma, Charlotta and Geken groups. Property was opened in 1890 and has become the principal copper producer of Norway. Has a good machinery equipment, with water power from an adjacent stream.

The ore bodies are extended lenses, very persistent in strike and depth, by one shaft and several tunnels. Ore is cupriferous iron pyrites, ranging in tenor from 1.5% to 5% copper and averaging about 3.5% copper and 45% sulphur. In addition to ore smelted, the mine ships about 40,000 tons of pyrites yearly, half fines and half lumps, these averaging 5% copper and 45% sulphur, to various burners in England, Sweden and Russia. Lenses occur in micaceous schists of lower Silurian age, which are near eruptive flows of greenstone conformable with the schists. Mines are about 2,000′ above sea-level.

Smelter has two 36″ water-jacket blast furnaces of about 35 tons daily capacity each, and one converter stand. Ore is roasted and smelted to 40% matte in the first fusion, then converted and product shipped as slightly auriferous converter bars. Product in 1902 was about 66,000 tons of ore and pyrites, returning about 2,800 long tons of copper, secured at an average cost of 6.8 cents per pound.

SULLIVAN GOLD & COPPER MINING CO. MONTANA.

Said to have claims near Kalispell, Flathead Co., Montana.

SULPHIDE COPPER CO. COLORADO.

Office: care of J. C. Lewis, president, Box 358, Denver, Colo. Lands are in the Rock Creek district of Gunnison county, Colorado, showing argentiferous copper sulphides.

SUMITOMO COPPER CO. JAPAN.

Office: Osaka, Japan. Mine office: Niihama, Iyo, Japan. Kichizaemon Sumitomo, president; Kinkichi Nakada, general manager; Tsuruzo Koike and Jozo Sugiura, assistant managers. Operates the Besshi mine, the second largest copper producer of the empire, located in the province of Iyo, on the island of Shikoku, Japan. This mine was opened in 1690, by the Sumitomo family, in whose capable hands it remains. The production was upwards of 3,000,000 pounds annually as early as the close of the Seventeenth Century.

Ore is chalcopyrite, associated with large quantities of iron pyrites and small proportions of lead, cobalt, manganese and arsenic, the ore averaging about 6% in copper. The vein varies in width from 4′ to 30′, averaging about 10′ to 20′, and has been developed to a length of about 6,000′. The vein occurs in alternating layers of chloritic and graphitic schists, each enveloped by a quartz schist, known locally as "habu," with a dip of 45° N. E., with interstratifications of piedmontite schist. Step-faults, running nearly parallel from east to west, occur among these, giving throws of 10′ to 20′ and sometimes as much as 60′. The mine has water and electric power and a 200-ton smelter. The equipment is excellent throughout, being thoroughly modern in every respect. Several thousand men and boys are employed in and about the mine and smelter. Production was 8,000,249 lbs. of refined copper in 1900, and about 12,000,000 lbs. in 1903.

SUMMIT MINING & MILLING CO. WASHINGTON.

Office: Davenport, Wash. Mine office, Keller, Ferry Co., Wash. C. H. Neal, president; C. A. Gray, secretary; H. R. Alexander, superintendent. Has a 100′ shaft, in argentiferous and slightly auriferous copper ore, assaying about $60 per ton.

SUN-ANCHOR MINING CO. **WYOMING.**

Mine office: Encampment, Carbon Co., Wyo. Capitalization $1,000,000. L. W. Tennant, president; Geo. Kuntzmann, secretary and treasurer. Lands, 3 claims.

SUN & MOON MINING & MILLING CO. **COLORADO.**

Mine office: Idaho Springs, Clear Creek Co., Colo. M. M. Simms, manager. Ores carry gold, silver, lead and copper. Has steam and electric power and employs about 100 men.

SUNDOWN MINE. **ARIZONA.**

Mine office: Globe, Gila Co., Ariz. L. C. Woods, superintendent.

SUNLIGHT MINING & MILLING CO. **COLORADO.**

Letter returned unclaimed from Eureka, San Juan Co., Colo.

SUNNY CORNER SILVER MINING CO. **AUSTRALIA.**

In the Sunny Corner Division of New South Wales, Australia. Secures a little copper as a by-product from silver ores, having made 38 tons of copper from 3,814 tons of ore smelted in 1901.

SUNNYSIDE COPPER MINING CO. **WYOMING.**

Letter returned unclaimed from Riverside, Carbon Co., Wyo.

SUNRISE COPPER CO. **WYOMING.**

Mine office: Sunrise, Wyo. Organized September, 1902, under laws of Wyoming. O. L. Vincent, president; H. P. Jarrad, secretary. Lands are about 11 miles from Sunrise. Property was worked originally as an iron mine, and the copper ores carry gold and silver values.

SUNSET GROUP. **BRITISH COLUMBIA.**

Seven claims, near Brown's Bay, above Seymour Narrows, Vancouver Island, B. C. Ores are chalcopyrite and bornite, with quartz gangue, traversing an amygdaloidal diabase.

SUNSET COPPER CO., LTD. **BRITISH COLUMBIA.**

Mine office: Princeton, Yale & Cariboo district, B. C.

SUNSET COPPER MINING CO. **WASHINGTON.**

Office: Colvin Bldg., Glens Falls, N. Y. Mine office: Index, Snohomish Co., Wash. Employs about 35 men. Organized 1897, under laws of Washington, with capitalization $3,000,000, shares $1 par; issued, $3,200,000. Addison B. Colvin, president; E. T. Johnson, treasurer; E. W. Cool, secretary; Hon. John C. Denny, chairman of executive committee; W. W. Black, general manager; Geo. C. Clark, superintendent; Etienne A. Ritter, engineer.

Lands, 23 claims, area 460 acres, also a 20-acre millsite and sundry water rights on Trout creek, in the Index district. Lands lie on the east side of the north fork of the Skykomish river, about 5 miles from Index, opposite the Ethel group, and are well timbered with white pine, cedar, spruce and fir, mainly the latter. Country rock is a belt of granite, exposed by erosion to a width of from 500' to several miles, and many miles in length, with a generally northwest and southeast trend. The granite shows parallel fissures, varying in width from a mere seam to several feet, on surface, and traceable up to 1,000' in length. In this district the smaller veins are short lived, disappearing entirely with a small amount of work. The extent of the large fissures is as yet unknown, but the main fissure of the Sunset gives promise of permanence, this having 3′ to 17′ width, with richest ores where widest. Ore is mainly auriferous chalcopyrite, at and near surface, with considerable argentiferous bornite at depth. Gangue is quartz, somewhat decomposed at surface, but solid at depth. Company reports ore as averaging 12% copper and 8 oz. silver per ton, with small gold values. Smelter returns were 9% copper from 300 tons of selected ore sent to the Puget Sound Reduction Works, at Everett. Development work of importance is practically all on one claim, which has about 1,800′ of underground openings. Principal working is a 596′ tunnel, which late in 1903 cut the vein, which showed the unexpected width of 17′, about 7′ being chalcopyrite and 10′ bornite. Ores from the face of drift from the main tunnel give average assays of 13.5% copper, 15.8 oz. silver and 0.1 oz. gold per ton. The ground stands well, requiring little timbering, and the mining work accomplished has been done in a substantial manner. Mr. Black estimates 200,000 tons of ore in sight, which is too high, and at close of 1902 the mine had about 17,000 tons of 6% ore blocked out for stoping.

The mine has small but adequate shops, bunk-houses, etc., and a small sawmill. A water power has been developed and an air-compressor plant is being installed. Mine has a 6½ mile tram-line to Index, with a suspension bridge over the Skykomish river, tram-line connecting at Index with the Great Northern railway.

Work has begun on a concentrator at the foot of the tramway incline. The ore is not well adapted to concentration, and tests on ore from this district have given very unsatisfactory results, the losses being heavy. The property is well located for cheap operation, with good transportation facilities, fuel at reasonable price, and a good water-power. The prospects of the mine have been much improved by the finding of a 17′ vein of good ore, apparently nearly all of smelting grade, in the lower tunnel.

As at least three things are required to make a successful mine, these being ore, money and management, and as the present promoter of the Sunset, W. H. Baldwin, has been implicated in a scandalous mining failure, careful investigation has been made for this publication, not only of the mine itself, on which three separate reports were secured from as many competent engineers of good standing, but also of the standing and methods of the men in charge of the property. The company was originally floated in 1897, with a great flourish of trumpets, but came to grief later, apparently through mismanagement rather than any intentional wrong-doing. The property was saved to its shareholders through the efforts of the original promoter, John E. McManus, a Seattle broker. Mr. McManus has proven his honesty by doing the square thing in a tight place, but his mining judgment is not so throughly established as his honesty. Judge Denny is thoroughly honorable, and would be mixed up in no promotion that he did not consider perfectly legitimate. He is at present judge of the Snohomish county superior court, and not only stands well as a citizen, but is considered to have very good judgment in mining matters. Geo. Clark, the present superintendent, is considered a bright mining man, thoroughly honest in all dealings and careful in his statements. Prof. E. A. Ritter, the engineer, was formerly connected with the geological survey of France, and enjoys an unblemished professional standing. W. H. Baldwin is the fiscal agent and power behind the throne in the affairs of the Sunset company, the pressing indebtedness of the company having been paid off by him in the summer of 1903. Baldwin has since sold a large amount of the company's stock, thus furnishing funds for development. In 1902 Baldwin promoted the stock of the rotten California & Nevada Mining Co., advertising this extensively as a sure thing, which was "guaranteed" to pay large dividends. The proposition proved, however, to be a rank swindle, and Baldwin's excuse is that he swallowed the lies told him by Chas. McKelvey, of Los Angeles, president of the California & Nevada, which were printed in big type in numerous advertisements, to the financial undoing of many small investors. Inasmuch as Baldwin's claims in these advertisements were so absolutely unfounded, his mining judgment must be taken as bad, even if his honesty is considered as established by his statement that the lies printed in his advertisements were second-hand. The California & Nevada was a guaranteed dividend mining stock of the rankest and rottenest sort, which no man with average good judgment would touch with tongs. After the collapse of the California & Nevada Mining Co. Baldwin became interested in the Sunset, and since then has repeatedly promised to protect the victims of his previous promotion, but has invariably stated such promise in the most general terms, and in such a manner that it is doubtful if any legal claim would be given the losers. Because of this promise Baldwin has been repeatedly and pointedly pressed to state just what he intends doing for his former victims, but has not yet committed himself to any definite promises, and is very indignant because the Copper Handbook has asked what he intends doing.

SUPERIOR COPPER CO. ARIZONA.

Office: 20 Broad St., New York. Letter returned unclaimed from former mine office, Tucson, Pima Co., Ariz. Organized under laws of Arizona, with capitalization $1,000,000, shares $1 par. T. B. Mills, president; W. L. Mercer, secretary; B. S. Coffman, general superintendent. Lands, 10 claims, area 200 acres, 26 miles south of Tucson, with a shallow shaft, showing ores averaging 6% copper and $5 to $18 gold per ton.

SUPERIOR COPPER CO., LTD. ONTARIO.

Office: Sault Ste Marie, Ont. Mine office: Superior Mine, via Algoma Central Ry., Algoma, Ont. Employs 40 men. Organized September 13, 1901, under laws of Ontario, with capitalization $1,500,000, increased 1903 to $2,000,000, shares $10 par. Frank Perry, president; E. G. Fisher, vice-president; Frank M. Perry, secretary, treasurer and superintendent; preceding officers, W. G. Martin, Geo. Kemp, H. B. Hanger, J. A. Culbeck, W. H. Teare and Geo. R. Nicholson, directors; P. A. Derry, mining captain. Lands, 8 crown-granted claims, area 680 acres, in an unorganized district of Algoma, showing 2 fissure veins, in country rocks of granite and green chloritic schists, with average strike N. 43° W., and dip of 70° to the southwest.

First vein averages 20′ in width, and second about 70′ width, these being traceable about 8,000′, with about 1,000′ uncovered on the smaller vein, and nearly a mile stripped on the larger vein. Development is by about 20 pits and trenches and by shafts of 40′, 70′, 100′, 150′ and 210′, with a total of 1,330′ of underground openings, estimated to show 500,000 tons of ore, with 134,000 tons blocked out for stoping. Ores are chalcopyrite, bornite and chalcocite, with quartz gangue, carrying estimated average values of 7% copper, 1 oz. silver and $2.50 gold per ton. Has a 120-h. p. steam plant, with one-half of a 12-drill Ingersoll-Sergeant air compressor, 2 hoists, 5 power drills, engine house, smithy, changing house, boarding house and 7 dwellings. Fuel is wood, costing $1.25 per cord. Considerable good ore has been stocked at the shafts. For 1903 a spur is to be built 3 miles to the Algoma Central Railroad; No. 6, the central and deepest shaft, is to be sunk to depth of 400′, and a rock-house and crushing plant installed. A concentrator may also be erected, but as the Superior ore is an ideal flux for the basic cupriferous and nickeliferous pyrrhotite of the Sudbury district, it may be decided to sell the ore as mined. The property is honestly and vigorously managed and is of considerable promise.

SUPERIOR COPPER & GOLD MINING CO.

Office: 64 East Second St., Salt Lake City, Utah.

SUPERIOR MINING CO. NEW MEXICO.

Mine office: Cerillos, Santa Fe Co., N. M. Sam Hughes, superintendent.

SUPERIOR MINING CO. WASHINGTON.

Office: 1529 Tower Ave., West Superior, Wis. Letter returned unclaimed from former mine office, Berlin, King Co., Wash. Organized 1902, under laws of Washington, with capitalization $2,000,000, shares $1 par. J. P. Simon, president and treasurer; B. A. Baerlocher, secretary and superintendent. Lands, 4 claims, area 82 acres, in the Miller River district, showing an 8′ fissure vein, opened by a 125′ tunnel, giving carbonate and sulphide copper ores, associated with galena, assaying 6% copper, 7 oz. silver and $1 to $30 gold per ton.

SUPERIOR-ALTA MINING CO. UTAH.

Office: care of Walter L. Maas, secretary and manager, Salt Lake City, Utah. Mine office: Salt Lake Co., Utah. J. A. Jacobson, president; L. A. Jeffs, vice-president. Capitalization $300,000, shares $1 par.

SURE THING COPPER MINING & SMELTING CO. WASHINGTON.

Mine office: North Bend, King Co., Wash. Lands, 7 claims, area about 145 acres, adjoining the Dutch Miller, slightly developed by crosscut tunnels.

SUSQUEHANNA GOLD MINING CO. BRITISH COLUMBIA.

Mine office: Hall, Yale & Cariboo district, B. C. T. Elwin, superintendent.

SWAKOPMUND MINING CO. GERMAN SOUTHWEST AFRICA.

Mine office: Corob, via Swakopmund, German Southwest Africa. Has sundry copper prospects, now undergoing development.

SWEDEN GROUP. WASHINGTON.

Lands, 8 claims, on the north shore of Spirit Lake, 6 miles from Mt.

St. Helens, Wash., showing a 33′ vein traceable 3,000′, said to yield ore assaying 9% copper, 6 oz. silver and $3.25 gold per ton.

SWINDLER MINE. **ARIZONA.**

Letter returned unclaimed from former mine office, Huron, Yavapai county, Arizona.

SWISHELM DEVELOPMENT CO. **ARIZONA.**

Lands, 40 claims, are in the Swishelm Mountains, Cochise county, Arizona. Employs 16 men.

SWISS GIRL MINING CO. **ARIZONA.**

Presumably out of business, as the Baumann Copper Co. has a Swiss Girl claim at same place, Dewey, Yavapai county, Arizona.

SYLVANIA MINE. **NEVADA.**

Mine office: Bullion, Elko Co., Nev. F. J. Frank, superintendent. Has shipped about 1,000 tons of ore. Vein has a 6′ pay-streak.

TABLAS-FINANA COPPER CO., LTD. **SPAIN.**

In voluntary liquidation.

TABLE MOUNTAIN COPPER CO. **ARIZONA.**

Letters returned unclaimed from Kelvin, Pinal Co., Ariz.

TACOMA COMPANY. **BRITISH COLUMBIA.**

Office: 407 Globe Blk., Seattle, Wash. Advertisements claim possession of marvellous mineral wealth, but claims not substantiated.

TACOMA SMELTING CO. **WASHINGTON.**

Works office: Tacoma, Pierce Co., Wash. W. R. Rust, general manager; F. W. Clark, superintendent. Employs about 250 men. Has an 800-ton smelter with 5 calcining furnaces and a blast furnace, equipped with steam and electric power. Plant has cost about $400,000 and company has a working capital of about $300,000, to purchase ores and carry finished products. Paid quarterly dividends of 2½% in 1903.

TADERGOUNT COPPER MINE. **ALGERIA.**

Shipped 200 tons of ore, in 1901, from some point in Algeria.

NTER MINE. **NEVADA.**

incoln Co., Nev. J. R. Newberry, owner. Idle.

MICHIGAN.

office: Calumet,

Official returns to the state of Michigan, as of date Jan. 1, 1903, disclose the following figures:

Amount cash paid in on capital stock	$ 580,000.00
Amount paid in by conveyance of property to company	200,000.00
Entire amount invested in real estate	203,186.00
Amount of personal estate	1,618,479.19
Amount of unsecured or floating debt, (including advances on copper since paid)	1,036,512.31
Amount due corporation (included in personal estate)	494,776.20
Production of copper, 1902,	15,961,528 lbs.

Lands 1,120 acres, in Sections 10, 11, 14 and 15, T. 56 N., R. 33 W., also a millsite on Torch Lake and extensive tracts of timber lands adjacent to mine and mill. The mine tract, of very irregular outline, is bounded on all sides by lands of the Calumet & Hecla. The Tamarack is opened on the underlays of the Calumet conglomerate and Osceola amygdaloid beds, the latter developed by crosscuts run east from the conglomerate workings. The mine was planned by the late Capt. John Daniell, who conceived the idea of opening the underlay of the conglomerate by a deep vertical shaft. Actual work of sinking No. 1 shaft was begun in 1882 and the conglomerate was cut in 1885, three and a half years later, at a depth only 10′ greater than the estimate of Capt. Daniell, made before the first sod was removed.

The mine is opened by 5 shafts, Nos. 1 and 2, in the extreme southeastern corner of the tract, being known as the Old Tamarack, with shafts 3 and 4 known as the North Tamarack, No. 5, the newest and deepest shaft, being about midway between. No. 1 cuts the conglomerate at 2,270′ and No. 2. at slightly greater depth. These shafts have given the richest rock found in the mine, and from the 40 acres developed by them practically all of the Tamarack dividends have been earned. No. 1 is 3,409′ in depth, with a productive capacity of about 400 tons daily. Owing to insufficient pillars, this shaft has suffered from drawing, but has not yet been retimbered, as its production cannot be spared. Shafts Nos. 1 and 2 are supplied with powerful hoists, good for the depths to which they can be sunk.

Nos. 3 and 4, the North Tamarack shafts, are about one mile north from and slightly east of shafts 1 and 2. No. 3 is 4,900′ deep and is located 4,200′ northeast of No. 2, cutting the conglomerate at a vertical depth of 4,185′. The conglomerate at this point runs 20′ to 25′ in width and is irregular in contents and far from rich, but some improvement has been shown recently in the southern drifts toward No. 5. Production of No. 3 shaft is about 1,000 tons of stamp-rock daily. A fire late in 1903 burned the roof of the engine house but did not injure the hoist. Surface equipment at the North Tamarack is very complete, No. 3 shaft having an Allis hoist, with double conical drum 13′ 6″ in diameter at either end and 36′ 9″ in the center. The cable winds over specially built-up runs of steel affixed to the surface of the drum, which works in counterbalance. This hoist has raised a 10-ton load vertically at a speed of 55 miles per hour, and running at that rate has been brought to a stop in a distance of 75′. No. 3 shaft has a 60-h. p. fan, 10′ in diameter, with blades 3′ 6″ wide, capable of supplying 192,000 cubic feet of free air per minute to the depth of the shaft. This fan not only ventilates the mine but also aids in reducing the temperature, which would otherwise be nearly 80° Farenheit in the bottom levels. The auxiliary hoist at No. 3, used for lowering and raising men and timber, is a Nordberg duplex, with 32x72″ cylinders and 72″ stroke, having a drum of 18′ 6″ diameter with lathe-turned grooves for coiling the cable. No. 4 shaft is 4,450′ in depth, and has not been deepened since bottomed in 1895. A rich chute of copper-bearing ground has been opened recently on the 14th level, but the shaft is poor as a whole. Underground connection is had with No. 3, giving ventilation, and safety to miners in case of accident.

No. 5 shaft, lying about 3,300′ southwest of No. 4, and about midway between the Old Tamarack and North Tamarack shafts, is 4,938′ in depth, being the deepest in the world. No sinking has been done since 1901. Sinking was begun Aug. 7, 1895, and the conglomerate was cut on Dec. 20, 1901, at a vertical depth of 4,662′, the late Capt. Wm. E. Parnall having foretold the depth within 12′ and the time required with in 11 days, when the work was begun, 6 years before. The shaft is 7x29′, inside measurement, with 5 compartments in a row. The three central compartments, 5′x7′ 2″ each, are used for cages. One of the end compartments, also used for a cage, is 7′ 2″x5′ 4″, the extra 4″ being allowed for timber strain, while at the other end of the shaft is a compartment 3′x7′ 2″ for ladders, pipes and wires. The 10x14″ wall-plates of this shaft are 29′2″ long and the 5x7″ runners serving as guides for the cages are 16′ to 22′ in length. Instead of the lag-screws being countersunk, the runners have a central groove 2″ wide and 1½″ deep, running from top to bottom on both sides of each of the four hoisting compartments, these grooves providing for the escape of lag-screws without damage to cages or runners, when screws work loose, as will happen occasionally. The shaft openings have automatic covers that lift for passage of the cages. In sinking this shaft 83 separate strata of trap, amygdaloid and conglomerate rocks, all barren, were cut before the Calumet conglomerate was reached. Drifts have been opened both north and south on the 31st to 38th levels inclusive, the northern drifts showing poor ground, with some improvement to the south. As a whole No. 5 shaft is decidedly low in grade, although the conglomerate is of good average width. Connection has been secured underground with Nos. 1 and 2 shafts, and No. 5 will be connected eventually with Nos. 3 and 4.

Surface equipment at No. 5 is the heaviest at any shaft of the mine. The engine house, boiler house and compressor buildings are of redstone, with steel truss roofs. The engine house has a 6,500-h. p. Nordberg hoist with four 36″ high pressure cylinders having 72″ stroke. The drum is 24′ in diameter in the center, tapering to 16′ at the sides, each half carrying 6,500′ of 1½″ steel cable, the hoist operating in counterbalance and being capable of raising from a depth of 6,000′ a net load of 6 tons of rock, this having a gross weight, with cage and cable, of about 12 tons. The hoist cost $60,000, and an exact duplicate, costing $90,000, is being installed, this being nearly three years overdue. The boiler house has six 200-h. p. Burt boilers with 84″ shells, and two 115′ brick-lined self-supporting steel smokestacks. Coal is delivered to the boiler room from a railroad trestle.

The 50x75′ redstone compressor building has a 35-drill Ingersoll-Sergeant two-stage cross-compound air compressor, with 18x34″ steam cylinders and 36″ stroke. A 100-drill compressor, ordered for installation in 1902, is now being set up, the last parts having arrived at the close of 1903, and will be in commission in the spring of 1904. The new compressor has 19x53″ steam cylinders with 48″ stroke and 3 pairs of two-stage air cylinders, each 18x27″, with 48″ stroke.

The shafthouse and rockhouse, built by the Wisconsin Bridge & Iron Co., at a cost of nearly $100,000, are on separate foundations and separately framed and braced, although apparently standing as one building 56x120′ on the ground, with an extreme height of 131′. The foundations are exceptionally massive and the girders and framing are of unusual strength, to withstand the great strains caused by hoisting heavy cages and the operation of powerful rock-breaking machinery. These buildings required about 700 tons of steel and 100 tons of corrugated iron siding in construction. Although 10 carloads of lumber were used in the building no wood is exposed, except in the floors, asbestos sheathing paper being used elsewhere to protect the wood, thus rendering the building practically fireproof. The rockhouse has 3 Portage Lake crushers of the reciprocating jaw type, with room for 5 more when needed. Miscellaneous buildings at No. 5 shaft include a stone dry and smithy.

Water for mine boilers and domestic use is pumped from Lake Superior against a head of nearly 700′. The pumping station, nearly 5 miles northwest of the mine, has a Nordberg duplex pump capable of raising nearly 1,500,000 gallons daily. Water is taken from a 40′ well on the lake shore, connected with a tunnel driven 480′ under the bed of the lake, with about 35′ of water above the intake. Water is delivered into two steel tanks, of 42′ and 65′ diameter, on the highest point of the Tamarack lands, these having a combined storage capacity of 200,000 gallons, water being distributed into mains from these standpipes. The pumping plant has developed remarkable efficiency, cost of operation being only about $10 per diem, including fuel and wages.

The Tamarack mine location is extensive, with a large number of dwellings for employes. The company owns and operates a hospital, 60x60′ in size, with two full stories, basement and attic. The basement and first floor are of selected Lake Superior redstone, upper story and attic of frame, with interior finish of selected quarter-sawed Georgia pine. The building has emergency wards, operating rooms, dispensary, sun veranda, elevators and indirect steam heating.

The Tamarack owns the old Cliff mine, in Keweenaw county, the oldest mine in the Lake Superior district, which paid dividends of $2,518,620 from 1849 to 1879, inclusive. The mine was opened on a fissure vein, which was worked out and the property abandoned in 1878. Some diamond drilling has been done in search of the Kearsarge amygdaloid on the Cliff tract, and borings will be resumed early in 1904.

The Tamarack has two stamp mills, located on Torch Lake, a little more than a mile south of the Calumet & Hecla mills. The mills have 7 stamps with an aggregate daily capacity of fully 2,500 tons of conglomerate rock. The heads have been fitted with eight-inch mortar-grates, opening into quarter-inch mesh revolving screens having Parnall-Krause hydraulic discharges. Finisher jigs have been replaced by Wilfley tables. The average cost of stamping a ton of rock was 31.48 cents in 1900, 24.95 cents in 1901 and 23.30 cents in 1902. Water for mills is furnished by a 40,000,000-gallon pump, operated jointly by the Osceola and Tamarack.

The wharves and steel coal-sheds of the Tamarack and Osceola, at Dollar Bay, are among the most extensive in the Lake Superior district.

Smelting is done at Dollar Bay and Hancock, in the works of Lake Superior Smelting Co., controlled by the Tamarack, Osceola and Isle Royale companies. All mineral is taken from mills to furnaces in hopper-cars, saving the cost of barreling.

Production of refined copper was 15,961,258 lbs., in 1902 and about the same in 1903. Total cost of copper, including construction account, was 11.67 cents per pound in 1901, 11.9 cents in 1902 and about the same in 1903. Mining is unavoidably expensive, owing to the opening of the conglomerate on the underlay. As the lode dips at an average angle of 37° 30′ and is opened by a vertical shaft at 90°, productive ground is reached only by long and expensive crosscuts, while trams are both long and costly. It would seem as though the Tamarack could install electric traction to advantage. The percentage of copper in rock stamped has shown a steady decrease for many years, and in 1902 was only 24.2 lbs. per ton, as compared with about 65 lbs. per ton in the early years of the mine. A considerable proportion of the rock stamped returns less than 1% ingot copper. The mine has paid dividends of $8,490,000 to the close of 1903, the last dividend having been paid in 1901, but a dividend of $1.50 per share was declared at the close of the year, payable Jan. 21, 1904, the last previous dividend having been $10.

TAMAYA MINE. **CHILE.**

An idle mine, formerly important, 65 miles from Coquimbo, Chile.

TAMARACK JUNIOR MINE. **MICHIGAN.**

Owned and operated by the Osceola Consolidated Mining Co.

TANGANYIKA CONCESSIONS, LTD. **RHODESIA.**

Offices: 30-31, Clements Lane, London, E. C., Eng. Registered Jan. 20, 1899, with capital, nominal, £194,000; issued, £174,000. Debentures, £30,000 authorized, £10,000 issued. Tyndale White, chairman; Robt. Williams, managing director; Geo. Grey, manager in Africa; R. M. Irwin, mine manager; John R. Farrell, consulting engineer; L. Dampier, secretary. Lands, 2,000 square miles, north of the Kafue and Zambesi rivers, in the Katanga district, Rhodesia, near the Congo Free State boundary, also 2,000 acres for railroad and steamship terminals, at the southern end of Lake Tanganyika.

Mines of the company, in various stages of development, are the Kansanshi, Kambobe, Kabalela, Kakanda, Likasye and Fungurume. Principal developments are on the Kansanshi, said to have a 16′ fissure vein, with north and south strike, which has been worked open-cast, by natives, for centuries, the mine showing trenches and pits for a distance of about 6,000′, these varying in width from 1′ to 75′ and in length from a few feet to 1,200′, with extreme depth of 50′ in the deepest pit. Country rock is sandstone, in places micaceous and fissile, and in other soft and clayey through partial decomposition, the sandstone being more or less charged with malachite, occurring as speiss. The vein matter carries malachite and chrysocolla above, with occasional occurrences of azurite and melaconite, but in the deeper portions has chalcocite and chalcopyrite in connection with iron pyrites, with occasional cuprite, the gangue being silicious, with considerable manganese dioxide in the superficial portions. The ferruginous matter in the gangue is chiefly limonite, usually somewhat ochrous, but occasionally hard and compact. The outcrops are mainly malachite, and are stated by Mr. Farrell to show no evidence of resulting from alteration of sulphides in place, and secondary enrichment being out of the question, the evidence leads to the opinion that the malachite was deposited from hot solutions coursing in a fissure. Five shafts have been sunk in old trenches, showing veins of 1′ to 16′ width, and ore is stated by Mr. Farrell to average 15% copper, at a depth of 100′, mainly from malachite, with traces of sulphides. Ore is silicious and will require heavy fluxing. The Fungurume mine has 4 short tunnels, one of which is stated to have penetrated 191′ of ore. The Likasye is also being opened by a tunnel. Principal developments outside of the Kansanshi are at the Kambobe No. 2, which has two shafts, H and I, about 100′ deep each, with crosscuts said to expose an ore body of nearly 300′ width.

The company owns and operates stores and also has a small steamer on Lake Tanganyika, laid up at last accounts. The company has a railway concession from the Portuguese government for construction of a line from Lobito Bay to Lake Tanganyika, which would require an expenditure of about £4,000,000. Efforts to finance this proposed railroad line have not been successful as yet.

TARBOX MINE. **MONTANA.**

Mine office: Saltese, Missoula Co., Mont. Has produced excellent specimens of high-grade copper ore.

TARTANA, LTD. **AUSTRALIA.**

Mine office: Chillagoe, Queensland, Australia. John Munro, superintendent. Lands are 230 acres leasehold on the Walsh River, 30 miles from Chillagoe. Ships hand-picked ore, running 15% copper and upwards, by camel, to the Chillagoe smelters.

TASMAN & CROWN LYELL EXTENDED MINING CO. **TASMANIA.**

Offices: 47, Queen St., Melbourne, Australia, and care of Hon. N. J.

Brown, agent, Hobart, Tasmania. R. Giles, chairman; John Brandon, secretary; E. Holehan, mine manager. Capital, nominal, £150,000; issued, £82,000. Lands, 181 acres, on Mt. Lyell, developed by 3 tunnels, longest 1,453, showing a little copper ore, with indications of larger bodies ahead. Employs 5 men.

TASMAN LYELL COPPER CO., LTD. TASMANIA.

Offices: 138, Leadenhall St., London, E. C., Eng. Mine office: Gormanston, Montague Co., Tasmania. H. M. Taylor, secretary; H. S. Muir, mine manager. Capital, £300,000. Lands, 200 acres, on Mt. Lyell. Employs about 25 men, and probably will amalgamate with Mt. Lyell-Comstock Copper Co., Ltd.

TASMANIA COPPER MINING & MILLING CO. COLORADO.

Office: 603 Provident Bldg., Philadelphia, Pa. Mine office: Winfield, Chaffee Co., Colo. D. B. Dance, vice-president; G. Albert Smyth, secretary; Edw. O. McHenry, treasurer. Organized April 20, 1898, under laws of Colorado, with capitalization $1,000,000, shares $1 par. Lands are about 400 acres, with about 2,600′ of underground openings showing ores carrying gold, silver, lead, copper and zinc. Has a pyritic smelter, of 20 to 40 tons daily capacity. Mine shows a large body estimated at 750,000 tons of auriferous and argentiferous copper ore, galena and sphalerite.

TASMANIAN COPPER CO., LTD. TASMANIA & SOUTH AUSTRALIA.

Offices: 348, Winchester House, London, E. C., Eng. Mine office: Rosebery, Montague Co., Tasmania. Capital, £325,000. Frank Lockhart Cox, chairman; Jos. G. Coldwells, secretary; C. M. Henrie, general manager. Lands, 386 acres, also 5-acre smelter-site, in the West Coast district, showing a 24′ fissure vein, traceable 3,000′, carrying 1% to 3% copper, 10 oz. silver and 3 dwts. gold per ton, in zinciferous chalcopyrite. Property is developed by tunnels, longest 644′, with about 1,600′ of underground openings, and is estimated to have about 400,000 tons of ore in sight. Ore being refractory and low in grade, no satisfactory method of treatment has yet been secured. Also owns the Blinman mine, South Australia.

TATERI MINE. JAPAN.

Mine office: Nosakogawa-mura, Yoshino-gori, Yamata, Japan. A very small producer of copper.

TAYLOR COPPER MINING CO., LTD. ONTARIO.

Office: care of Robt. H. Taylor, president, Sault Ste. Marie, Mich.

TECOLOTE COPPER CO. NEW MEXICO.

Mine office: Las Vegas, San Miguel Co., N. M. Has steam power, and a concentrator, built in 1903.

TECUMSEH COPPER CO, MICHIGAN.

Office: 15 Congress St., Boston, Mass. Mine office: Calumet, Houghton Co., Mich. Organized under laws of Michigan, with capitalization $2,500,000, shares $25 par; 45,041 shares unissued. John C. Watson, president; Daniel L. Demmon, secretary and treasurer; Jas. Chynoweth, superintendent. Lands, 560 acres, next south of the Osceola. Several shafts have been sunk at various times, including one of 1,000′ on the Calumet conglomerate, which was barren, and another of about 2,300′ on the Osceola lode. Idle since November, 1902.

TEHAMA MINING CO. CALIFORNIA.

Office: care of C. J. Gooch, president, Red Bluff, Cal. Idle. Property is the Donkey mine, supposedly a continuation of the Afterthought of the Great Western Gold Co., in Shasta county, California, and is said to show a considerable body of medium-grade ore.

TELEPHONE-ANCHOR MINE. WYOMING.

Mine office: Rambler, Carbon Co., Wyo. Lee Campbell, superintendent.

TELLER MINING & MILLING CO. COLORADO.

Mine office: Idaho Springs, Clear Creek Co., Colo. John Owen, manager. Ores carry gold, silver, lead and copper. Has steam power.

TEMPEST MINING & SMELTING CO. OREGON.

Mine office: Adams, Umatilla Co., Ore. Ores carry gold, silver and copper. Has electric power and 20-ton smelter, employing 25 men.

FUNDICION TEMPLEMAN, LTD. CHILE.

In voluntary liquidation. J. G. Fowler, liquidator, 3, Fredericks Place, Old Jewry, London, E. C., Eng. Property is extensive smelters, at Antofagasta, Chile, and sundry mines in Tarapaca, Chile.

TENDERFOOT MINING COMPANY. WYOMING.

Mine office: Douglas, Converse Co., Wyo. W. F. Hamilton, president; B. J. Erwin, secretary and treasurer. Lands, 6 claims, with a 90′ shaft, showing ore averaging 4.5% copper. Has a steam hoist, good for depth of 700′.

TENNESSEE COPPER CO. TENNESSEE.

Office: 11 Broadway, New York. Mine office: Copperhill, Polk Co., Tenn. Employs 1,000 men. Organized 1899, under laws of New Jersey, with capitalization $5,000,000, shares $25 par; issued, $4,375,000. Debentures, $500,000 in 20-year 5% bonds of $1,000 each. First dividend, $1.25 per share, amounting to $218,750, was paid July 30, 1903, and it is expected that semi-annual dividends will be paid hereafter. J. Parke Channing, president; Frederick Lewisohn, vice-president; J. H. Susmann, treasurer, preceding officers constituting the executive committee; E. C. Westervelt, secretary; preceding officers, H. H. Rogers, A. C. Burrage, Walter Lewisohn, Edw. Buffum, Jas. Phillips, Jr., directors; Randolph Adams, general manager; Wm. Heywood, smelter superintendent; John Edwards, mine superintendent; B. B. Gottsberger, engineer; State Street Trust Co., of Boston, registrar; Old Colony Trust Co., of Boston, transfer agent.

Lands, 2,080 acres, also 11,000 acres of miscellaneous lands, in the Ducktown district, showing 6 series of lenses, of which 3 are being developed. Ore occurs as lenses in fissure veins, lenses averaging 30′ to 70′ in width and 500′ to 2,000′ in length, with an average depth of 400′. Ore is chapcopyrite, associated with iron pyrites in a quartz gangue, carrying 2% to 4% copper, about 40% iron, 27% sulphur and 15% silica, with only traces of gold and silver. Country rock is metamorphic micaceous schists, of pre-Cambrian age, ore bodies showing extensive gossan cappings, and originally having a little oxidized ore near surface, which was mined out long ago. As zinc and other refractory elements are lacking, the ore is excellently adapted to cheap and close concentration, and also smelts well, giving very clean slags.

Mines of the company include the Burra Burra, London, Tennessee, and Polk county, each developed to depths of 300′ or more. These mines were opened circa 1850, and were regularly operated previous to the Civil War. The principal property is the Burra Burra, having one shaft of 280′ and 2 shafts of 400′ each, sunk in the solid footwall to guard against drawing. This mine has about 8,000′ of underground openings, not including worked-out stopes, with about 1,500,000 tons of ore blocked out for stoping. The lense is 30′ to 85′ in width and opened for a distance of 1,030′ on the third level. The London mine has a 400′ main shaft, with a lense 25′ to 75′ in width, and 500′ long on the first level. The Polk County mine has a 300′ shaft, with an ore body 20′ to 90′ in width and of undetermined length and depth.

The mines have a complete machinery plant, including water-tube boilers, Nordberg first-motion hoists, and a Nordberg cross-compound two-stage air compressor. The shafthouses are a sort of cross between the rockhouses of the Lake Superior mines and the concentrators of the ordinary copper mines, being equipped with 100-h. p. compound engines, 18x31″ crushers, 42′x′144 screens and 36″x33′ Robins conveying belts for hand-sorting, these shafthouses having a daily crushing and assorting capacity of about 2,000 tons, ore being reduced to 4″ size. The Burra Burra shafthouse is 127′ in height.

The smelter, at Isabella Junction, is a little north of the old Tennessee mine, and one to five miles from the other mines of the company. Ore is taken to the smelter over the company's 7½ mile standard gauge private railroad, connecting with the Atlantic, Knoxville & Western Ry., and equipped with four 50-ton locomotives and 65 thirty-ton ore cars. The company owns about 60 dwellings for employes.

Before smelting the ore is heap-roasted, at an average cost of 35c. per ton. The roast-yard has an area of 30 acres and capacity of 135,000 tons, with over 3 miles of railroad track, roast-heaps being protected by sheds. Heaps are burned for 10 to 11 weeks each. The reduction plant was designed by J. Parke Channing, and built under his supervision, the entire plant being admirably planned in logical order, all material being handled automatically wherever possible. The results obtained are among the best ever secured at any copper smelter, this plant having attracted much attention from mining men and the technical press. The smelter building is of steel, with large ore bins, and the works have a daily capacity of 1,500 tons, being equipped with 3 water-jacket blast furnaces, 50x180″ at the tuyeres, 72x180″ at the tops and 18′ from tuyeres to charging floor. Furnaces are charged by 2-ton cars, drawn by electric locomotives, a limited amount of barren quartz being used as a flux in furnace mixtures. The third furnace was blown in December, 1903. Furnaces have 3 Nordberg cross-compound condensing blowing engines, with steam cylinders 56″ and 56x42″, running

66 revolutions per minute and delivering air at a blast pressure of 35 oz. to 40 oz. per square inch. There is also a 25-ton refining furnace, 2 stands of converters with 84x126″ shells, and a horizontal blower for the converters. Slag-pots are handled by electric locomotives, slag being used as railroad ballast. The plant has a large dust-chamber. The power-house at the smelter is of steel and brick, with four 250-h. p. water-tube boilers, and an electric plant furnishing power and light.

Production of refined copper in 1903 was approximately 10,700,000 lbs., and should exceed 15,000,000 lbs. in 1904. Profits were $231,109.14 in 1902, and were probably nearly $500,000 in 1903. Cost of refined copper was 9.21c. per pound in 1902, and between 8.5c. and 9c. in 1903. The fumes from the smelting plant have wrought great damage to standing timber in six adjoining counties in the state of Georgia, and to obviate further trouble of this sort an acid plant will be installed to care for the gases. The Tennessee ore is the lowest in grade of any smelted that does not carry gold or silver values, returning an average of 38 to 39 lbs. only per ton, but notwithstanding its exceedingly low grade, the property has many advantages, such as large ore bodies of very uniform grade, low wages, cheap living costs for labor, a thoroughly modern plant, adequate capital, and the very best of management in every department. Notwithstanding the remarkably good results already secured, the company plans changing its method of smelting in 1904, when two furnaces will be run on raw ores and one on roasted ore. Pyritic smelting has been made a marked success by the Ducktown Sulphur & Copper Co., working an adjoining property, and it is believed that the Tennessee can adopt this process at a considerable saving from the present low costs.

TERANO MINE. **JAPAN.**

Mine office: Saretani-mura, Iyo-gori, Iyo, Japan. Ore is chalcopyrite, associated with iron pyrites, averaging 4% to 5% copper. Vein averages 1′ to 2′ and is occasionally 7′ wide, in country rock of chloritic schist. Production in 1898 was 25,974 lbs. of refined copper.

TETON COPPER MINING & SMELTING CO. **WYOMING.**

Letter returned unclaimed from former office, Jackson Hole, Wyo. Was organized in 1903 to prospect for copper in the Teton mountain range of Wyoming.

TEXADA COPPER MINING CO. **BRITISH COLUMBIA.**

Office: 205 Equitable Bldg., Tacoma, Wash. Mine office: Van Anda, Texada Island, B. C. Employs 6 to 10 men. Organized May 12, 1903, under laws of Washington, with capitalization $1,000,000, shares $1 par. J. M. Dennett, president and general manager; O. L. Doane, secretary. Lands, 7 claims, area 270 acres, held under 30-year lease, with 230 acres of miscellaneous lands, in the Nanaimo district, showing several outcrops, one averaging 18″ width at surface and 24″ at depth, opened by a 70′ shaft showing chalcopyrite and bornite assaying 12% copper, 10 oz. silver and $2.80 gold per ton. Has a steam hoist and air compressor, and plans shipping ores to smelters by water, over a 900′ surface tram from shafts to bunkers on wharves at tidewater.

TEXAS CONSOLIDATED MINES & POWER CO. **CALIFORNIA.**

Mine office: Redding, Shasta Co., Cal. H. C. Woodrow, superintendent. Ores carry gold, silver and copper. Has electric power and 20-stamp mill.

TEXAS COPPER CO. **TEXAS.**

Office: care of Glenn N. Congdon, Gowanda, N. Y. Organized July, 1902, under laws of New York, with capitalization $1,000,000. Lands comprise sundry claims in Texas, carrying indications of copper, salt and gypsum.

TEZIUTLAN COPPER CO. **MEXICO.**

Office: 27 William St., New York. Mine office: La Aurora, via Teziutlán, Puebla, Mex. Employs about 800 men. Organized under laws of New Jersey, with capitalization $1,000,000, shares $100 par. Geo. D. Barron, president and general manager; Robt. S. Towne, vice-president; C. J. Nourse, Jr., secretary and treasurer; E. R. Dalbey, general manager; F. R. Brown, assistant manager; A. F. Schneider, mill superintendent; E. du B. Lukis, engineer. Lands, 4,005 acres, also a 15-acre smelter-site and 400 acres of miscellaneous lands, in the Teziutlán district. Climate is equable and property is surrounded by fine arable lands. Labor is good and in sufficient supply, and property is served by the Interoceanic Railway of Mexico.

The mine is developed mainly by tunnels, developing a considerable body of basic auriferous and argentiferous chalcopyrite, associated with sphalerite, carrying about 8% copper, up to 200 grams silver and 5 grams gold per metric ton. Ores also carry about 15% iron, 2% sulphur, 30% silica and 10% calcium. Water is brought by a 3,600′ flume, under a 900′ head, generating 1,000 h. p., which is transmitted electrically to the mine, about 6 kilometres distant. Smelter, adjacent to the mine, receives ore by aerial tram. The smelting plant has about 250 tons daily capacity, treating about 5,000 tons monthly, shipping product as converter bars averaging 98.6% fine. Production in 1902 was 3,079.2 metric tons of refined copper. The Teziutlán is the most important copper mine in southern Mexico, and is said to be earning good profits.

THARSIS SULPHUR & COPPER CO., LTD. **SPAIN.**

Offices: 136, West George St., Glasgow, Scotland. Mine office: Alosno, Huelva, Spain. Sir C. Tennant, Bart., chairman; A. Moore, Jr. and R. C. Mackenzie, auditors; Wm. P. Rutherford, mine manager; Geo. Gray, superintendent; D. Barlas, secretary; Cyril E. Brackenbury, consulting enginer. Registered October 27, 1866, with capital £1,250,000, shares £2 par.

Lands include the Tharsis group, area 1,133 hectareas, and the Lagunazo group, area 271 hectareas, at Alosno, about 30 miles west of the Rio Tinto, also the Calañas group, area 618 hectareas, at Calañas, midway between the Tharsis and Rio Tinto mines. The mines at Alosno were worked by the Romans, and probably by their predecessors as well, and are identified by some with the Tarsish of the Bible. General geological conditions are much the same as at the Rio Tinto, the mines being in the southern zone of the Andevallo or Sierra Morena district of Huelva, showing 4 main lenses, these having their axes of greatest length southeast by northwest. The largest lense is the Criadero del Sur, to the south. The Filon del Norte, to the northeast, is about 600 metres long and 140 metres in extreme width. The two smaller lenses are the Criadero de la Sierra Buillones and the Filon del Medio, to the northwest. The Tharsis and Lagunazo mines, which have been the principal producers in the past, are nearing exhaustion, but the Calañas is developing rather better than expected, and now has ore reserves for about 10 years' production. The company is also developing the Almegrera and Triunfo groups, near Alosno. The ores of the Tharsis average about 3% copper, 50% sulphur and 45% iron, with small quantities of gold, silver, lead, zinc, nickel, bismuth, antimony and arsenic.

After extraction the ore is piled in heaps and weathered, this process being assisted by occasional sprinkling. The leach-water goes into creosoted timber sluices, where the copper in solution is deposited on pig-iron. The company owns a railway leading from the mine to Corales and has a shipping pier at that port. The company also owns extensive works at Hebburn-on-Tyne, Willington-on-Tyne, at Oldbury, a suburb of Birmingham, at Garngad, a suburb of Glasgow, and at Cardiff, Wales.

Owing to the exhaustion of its principal ore bodies and a rather alarming annual decrease in production, the company has been endeavoring for several years to secure new mines, and with that end in view has investigated sundry properties in Norway, Italy, Cyprus, Russia, Tennessee, Arizona and Mexico. The company recently bought the Aamdal mine at Mo, Bratsbergamt, Norway, which made 240 tons of refined copper in 1895, and has given this property considerable development, proving up a large ore body of lower grade than expected, the Aamdal having proven disappointing.

Production of copper was 11,147 long tons in 1898, 7,967 tons in 1900, 6,708 tons in 1902 and probably about 6,000 tons in 1903, showing a decrease of nearly one-half in five years, owing to the practical exhauston of the largest Spanish ore bodies. The company has paid annual dividends since 1890, total payments being £7,820,932. The 1903 dividend was 6s., or 15%, amounting to £187,500. The largest dividend was 37½% in 1899.

THOMPSON SIDING COPPER-GOLD MINES, LTD. BRITISH COLUMBIA.

Offices: 5, Copthall Bldgs., London, E. C., Eng. C. Handley, secretary. Capital, nominal, £90,000. Lands, supposedly in British Columbia.

THREE BEARS MINING COMPANY. NEW MEXICO.

Office: 212 South Front St., Philadelphia, Pa. Mine office: Jarilla, Otero Co., N. M. Employs 10 men. Organized Jan. 27, 1903, under laws of New Jersey, with capitalization $2,000,000, shares $1 par. I. W. Heysinger, president; D. F. Schermerhorn, general manager. Lands, 12 claims, area 240 acres, showing a contact vein between porphyry and limestone, said to average 115′ width and to give average returns of 4% copper, 5 oz. silver and $3 gold per ton, from malachite, opened by a 255′ shaft, with 2,300′ of underground openings. Company contemplates continuance of development work and installation of steam plant and power drills.

THREE JAYS COPPER CO. **BRITISH COLUMBIA.**

Mine office: Alberni, Vancouver Island, B. C. Was a small shipper, 1901-1902. Idle.

THREE PEAKS MINING CO. **CALIFORNIA.**

Office: care of T. S. Henderson & Co., 500 Commercial Bldg., St. Louis, Mo. J. J. Chambers, vice-president and general manager. Lands are in Trinity county, California. Ores carry gold and copper.

VEREINIGTE THURINGISCHE KUPFERBERGBAU GEWERKSCHAFT. **GERMANY.**

Mine office: Eisenach, Weimar, Germany.

ASOCACION DE PROPRIETARIOS DE LAS MINAS DEL TIBIADO. **SPAIN.**

Offices: Moncada 21, Barcelona, Spain. Mine office: Tibiado, Barcelona, Spain. Has a chalcopyrite ore body.

TICON MINE. **MONTANA.**

Office and mine: care of James A. Murray, owner, Butte, Silver Bow Co., Mont. Lies east of the Speculator mine, and has a 500′ shaft, sunk on the pitch of the vein, bottomed in about 4′ of good ore.

TIGER MINE. **NEVADA.**

Mine office: care of J. A. Nelson, owner, Lovelock, Humboldt Co., Nev.

TILT COVE COPPER CO., LTD. **NEWFOUNDLAND.**

Offices: 9, Queen St. Pl., London, E. C., Eng. Col. J. W. Young, chairman; E. C. Leaver, secretary; John Taylor & Sons, managers. Capital, nominal, £200,000; issued, £178,000. Freehold lands include the Tilt Cove mine at Tilt Cove, Nfld., leased for 99 years to the Cape Copper Co., at an annual rental of £4,400, plus one-half of net profits earned, lease being terminable on a year's notice from the lessees. Has been in litigation with the lessees over matter of profits.

TIMBER PEAK MINING CO. **NEW MEXICO.**

Mine office: Socorro, Socorro Co., N. M. Cony T. Brown, manager. Ores carry gold, silver and copper. Has steam power and 150-ton concentrator. Employs about 50 men.

TINTIC CO. **UTAH.**

Office: Salt Lake City, Utah. Organized 1903, under laws of Maine, with capitalization $3,000,000, shares $5 par. Is the parent company of the Tintic Mining & Development Co., Yampa Smelting Co. and West Mountain Tramway Co.

TINTIC MINING & DEVELOPMENT CO. **UTAH.**

Office: Salt Lake City, Utah. Mine office: Bingham Canyon, Salt Lake Co., Utah. Organized 1896, with capitalization $3,000,000, shares $5 par. Is subsidiary to the Tintic Company, and managed as a close corporation. Capt. Henry Stern, president; Geo. H. Robinson, general manager; W. J. Craig, superintendent; Jas. W. Neill, consulting engineer and metallurgist. Lands are the Yampa group, area about 100 acres, near the Utah Consolidated and Boston Consolidated, showing a vein of 10′ to 37′ width carrying disseminated chalcocite, covellite and chalcopyrite giving average returns of 3% to 4% copper and from $2 to $5.60 gold per ton, with considerable silver values. Ores are highly ferruginous, making them valuable for fluxing the silicious ores of the Bingham district.

The mine has been extensively developed, being opened to a depth of 1800′ by a 1,300 shaft and two tunnels, with about 7,000′ of underground openings. The upper or Yampa tunnel, 650′ below the crest, is 1,400′ in length, following the ore body, and the lower or drain tunnel is a crosscut for 2,200′, thence follows the vein for 400′. Tunnels are connected by an incline shaft of 1,300′. The mine has about 40,000 tons of ore on the dumps, with very large ore reserves developed, and is capable of making a considerable production at an early date.

The smelter, near the mine and to be connected therewith by an aerial tram, has a 250-ton Allis-Chalmers water-jacket furnace, with bins, power plant, dust-flues, and stack planned for two 250-ton furnaces. This smelter is to be blown in early in 1904, and will make matte only at the start. The mine shipped considerable ore to the Bingham smelter in 1903, production being said to have paid development expenses. The new smelter should produce about 175 to 200 tons of copper monthly, after blown in. The property is well managed, and none of the Bingham mines have been developed more sensibly, time having been taken to secure ample underground openings before building the reduction plant.

TINTO MINE. AUSTRALIA.

Mine office: Murrin Murrin, Western Australia. A property of promise, on which considerable development has been secured in the past year. Assays give 16% copper, 20 oz. silver and 1 oz. gold per ton.

SOCIETE TINTO ET SANTA ROSA. SPAIN.

Office: Brussels, Belgium. Mine office: Zalamea, Huelva, Spain. Lands, 114 hectareas, including 11 mines, near Zalamea. Output in 1899 was 760 long tons of refined copper.

TIP TOP MINE. IDAHO.

Office: care of J. Q. Packard, general manager, Worthington Bldg., Salt Lake City, Utah. Mine office: Doniphan, Blaine Co., Idaho. J. A. Lusk, superintendent. Lands, 12 patented claims, area 220 acres, in the Hailey district, developed by shafts of 500′ and 1,100′, with 7,000′ of underground openings. Has a complete steam plant, a 20-stamp mill, and 50-ton cyanide plant, working cupriferous gold ores.

TIP TOP COPPER CO. ARIZONA.

Mine office: Helvetia, Pima Co., Ariz. Employs 25 men. L. E. McBane, superintendent. Property is the Tip Top and Copper Duke claims, sometimes known as the Little Helvetia, developed by 2 tunnels, with a 1,000′ shaft planned. Is said to have about $200,000 worth of ore blocked out, and plans leasing the idle smelter of the Helvetia company.

TIPTON COPPER CO. NEW MEXICO.

Letter returned unclaimed from Tularosa, Donna Ana Co., N. M.

COMPANIA MINERA TIRO GENERAL Y ANEXAS. MEXICO.

Mine office: Charcas, San Luis Potosi, Mex. G. Stadleman, superintendent. Has silver-copper ores, opened by shafts. Is equipped with steam power and employs about 200 men.

MINAS TODOS SANTOS, LA NIEVA Y ANEXAS, MEXICO.

Office: Mazapil, Zacatecas, Mex. Francisco Rodriguez Orozco y Ca., owners and managers. Ores carry gold, silver, lead and copper. Main shaft, 175′; main tunnel, 1,000′. Has a 75-ton smelter and employs about 150 men.

SOCIETE ANONYMA MINES METALIQUES DE TOLOSA. SPAIN.

Mine office: Tolosa, Navarra, Spain. Property includes La Leiza mine, ores of which carry chalcopyrite and galena. Was undergoing development at last accounts.

TOLTEC CONSOLIDATED MINE. MICHIGAN.

Lands, 320 acres, at Greenland, Ontonagon county, Michigan. Production, 1851-1860, was 206 tons, 1,443 lbs., made at a loss of about $500,000.

TOM HAL MINING CO. WASHINGTON.

Mine office: Pateros, Wash. Thos. B. Warren, president and general manager. Lands, 5 claims, showing vein of 4′ to 10′, carrying auriferous and slightly argentiferous chalcopyrite, arsenopyrite and iron pyrites. Has steam power.

TOMAHAWK COPPER & ZINC MINING CO.

Office: 132 Broadway, New York. Location of lands unknown.

TONOPAH-ALOHA MINING CO. NEVADA.

Office and mine: care of W. D. Nelligan, president, Tonopah, Nye Co., Nev. F. W. Johnson, secretary, San Francisco, Cal. Organized 1903, under laws of South Dakota, with capitalization $1,000,000, shares $1 par. Lands, 6 claims, in the Lone Mountain district. Has secured ores assaying up to 12% copper and $60 gold per ton.

TONOPAH-UTAH MINE. NEVADA.

Mine office: Tonopah, Nye Co., Nev. J. L. Justice, president. Has secured assays of 9% copper, 42 oz. silver and $6 gold per ton.

TORCH LAKE MINING CO. MICHIGAN.

Office and mine: care of W. W. Stockley, Hancock, Houghton Co., Mich. Capitalization $500,000, shares $25 par. Lands, 1,280 acres, midway between Calumet and Lake Linden, slightly prospected by diamond drill borings, 1899-1900.

TORPEDO MINING CO. NEW MEXICO.

Office: 135 Adams St., Chicago, Ills. Mine office: Organ, Donna Ana Co., N. M. Geo. E. Wood, president; Harvey E. Rich, secretary; C. B. Rogers, superintendent. Lands adjoin the Copper Bar. Has steam power and good machinery equipment, and has produced upwards of 4,000 tons of ore. Has been much troubled by water, which is now under control. Employs about 50 men, and is developing on a business-like basis.

TOSTON COPPER COMPANY. MONTANA.

Office: Pennsylvania Bldg., Butte, Silver Bow Co., Mont. Mine office: Toston, Broadwater Co., Mont. David J. Charles, president; Emil H. Renisch, vice-president; John A. Shelton, secretary; W. K. Edwards, general manager. Organized Dec. 24, 1903, under laws of Arizona, with capitalization $1,250,000, shares $5 par. Lands, 6 claims, area 120 acres, showing 3 fissure veins in porphyry, with a 200′ shaft in a vein of about 15′ average width, showing chalcopyrite assaying 6% copper, 1 oz. silver and $2 gold per ton. Company is arranging to begin actual development work early in 1904.

TOWADA MINE. JAPAN.

Mine office: Nantaki-mura, Kazuno-gori, Rikuchu, Japan. Owned by the Fujiti Gummi, of Osaka. Discovered circa 1670. Is located in the midst of high mountains and is very difficult of access. Vein ranges 30′ to 100′ wide and carries auriferous chalcopyrite and argentite.

TRAINER MINE. COLORADO.

Mine office: Ascroft, Pitkin Co., Colo. Michael Hogan, owner; Wm. P. Greene, superintendent. Ores carry silver, lead and copper.

TRANSVAAL COPPER COMPANY. MEXICO.

Office: 1408 Traction Bldg., Cincinnati, Ohio. Mine office: Cumpas, Sonora, Mex. Employs 200 men. J. R. Thomas, president; J. M. Eilers, vice-president; O. C. Rasch, secretary; Alfred Vogeler, treasurer; preceding officers, R. A. Koehler, L, J. Hauck, L. K. Marty, Louis Hehman and Bernhard Freiberg, directors; Leo G. Cloud, general manager; O. L. Neer, superintendent; Jas. T. McDonald, mine superintendent; Chas. L. Rogers, assayer; W. F. Neihart, cashier. Organized December, 1901, and reorganized July, 1903, with increase of capitalization to $6,200,000, shares $10 par; issued, $4,000,000. At close of 1903 had $85,000 cash on hand, and $9,500 due company, without accrued liabilities of any sort. Annual meeting, first Tuesday in August.

Lands, 794 pertenencias, area 1,966 acres, also 25,000 acres of timber and miscellaneous lands, in the Moctezuma district of Sonora. Lands show 10 ore bodies, which so far have developed ore of the following approximate dimensions: Cobre Rico vein, 300′ wide, opened to depth of 250′ and traced for 600′ in length; Transvaal No. 1, 280′ wide; Buckeye, 4′ wide, opened to depth of 100′; Ultima Chanza, 4′ wide, opened to depth of 25′; Verde Cliff, 50′ wide, opened to 50′ depth; San Nicolas, 30′ wide, opened to 120′ depth and traced 270′ in length; San Nicolas No. 2, 4′ wide, opened to 100′ depth and traced 150′ in length; San Luis, 2′ wide, opened to 100′ depth and traced 140′ in length; Capoline, 3′ wide, opened to 160′ depth and traced 200′ in length; Virginia, 8′ wide, opened to 75′ depth and traced 2,000′ in length. These veins occur as fissures and mineralized dykes, in trachyte and rhyolite. Ores are bornite and chalcopyrite, also chalcocite, the latter sparingly, with outcrops of oxidized ores. The larger ore bodies give average assays of 5% copper with assays of 10% to 20% copper from the smaller veins, the large sulphide ore bodies being slightly auriferous and argentiferous. The ores occur associated with iron pyrites, with a quartz gangue, and will probably prove quite silicious in working. The mines are 3,500′ to 4,500′ above sea level. Development is by 11 shafts, deepest being the Transvaal, down 350′, and by 13 tunnels of 100′ to 670′ length, with a total of 8,000′ of underground openings, estimated by Mr. Cloud to show about 2,500,000 tons of ore.

furnace linings. Before charging, ore is roasted in a hearth receiving heat from the smelting hearth. Conversion is by a special hearth under the smelting hearth, molten matte flowing across an aerated zone, over which passes a continuous stream of flux to prevent consumption of the converter linings, giving, in theory, a continuous process of reduction, with a final product of blister copper. The new hydro-carbon smelter is said by the company to be a success, but after more than a year's experimental trials is not in commission.

The holdings of the Geo. A. Treadwell mining company include some property that is regarded as valuable, the Brookshire mine being of more than ordinary promise. The company is said to have expended nearly $1,000,000, but what proportion of this has gone for advertising is not known. The advertisements of the company have contained many misleading statements, and have claimed entirely too much on the strength of Prof. Treadwell's former brief connections with the United Verde and Greene Consolidated mines. The company has not been able to redeem any of its promises regarding early production, and is not now in a condition to secure more than a small output of ore, while the hydro-carbon smelter is an experiment pure and simple, and does not give any marked evidence of proving successful.

MINA TRES GRACIAS. CHILE.

Office and mine: Chañaral, Atacama, Chile. Basilio Caceres, owner; Roberto Caceres, manager. Has steam power and employs 100 men.

TREVEDDOE MINING CO., LTD. ENGLAND.

Offices: 13, Throgmorton Ave., London, E. C., Eng. Mine office: Bodmin, Cornwall, Eng. J. Morris, chairman; W. H. Adams, secretary. Capital, nominal, £100,000; issued, £95,000; debentures, £10,000, at 5%. Lands, 500 acres, held on 100-year lease, bearing tin and copper ores. Production in 1901 was 85 tons of black tin and 153 tons of 7% copper ore.

TREVINO Y ZERTUCHE. MEXICO.

Office and mine: Viesca, Coahuila, Mexico. Lands include several groups of mines carrying gold, silver, lead, copper and iron. Mines idle.

TRI-BULLION SMELTING & DEVELOPMENT CO. ARIZONA.

Office: 307 Fort Dearborn Bldg., Chicago, Ill. Mine office: San Carlos, Graham Co., Ariz. Employs 25 men. Organized 1903, with capitalization $5,250,000. Hon. Howard Paschal, president and general maanger; J. P. Hendrick, secretary and treasurer; W. J. Nicholson, superintendent; H. C. Erman, consulting engineer; Jas. Camp, foreman. Lands, 12 claims, in the Stanley Butte district, 8 miles south of San Carlos. Mine was discovered 1886, but lands were set aside later as part of the San Carlos Apache Indian reservation, and were not segregated until 1901. Mining work was begun January, 1903. Country rocks are quartzite, porphyry and limestone. Principal claims are the Starlight and Will Ryan. The Starlight has a 90′ shaft and a tunnel, to cut the main vein at depth of 500′ at a distance of 1,000′, which has already cut two other veins showing auriferous and argentiferous copper ore. Survey has been made for a tram-line 2,000′ long, with a 22% grade, from the Starlight to the wagon road in Kelley Gulch. The

Ryan crosscut tunnel, about 500′ long, is to be driven 1,200′. The property has the remains of an old adobe smelter, a hundred years or more of age, showing that the mines were formerly worked by Spaniards. The company also owns the Michigan gold mine, 7 miles northwest of Ishpeming, Marquette county, Michigan, on which a little work was done in 1903, and where work will be resumed in spring of 1904. This property, discovered 1885, while not the largest is unquestionably the richest gold mine in Michigan, having a vein of 18″ to 30″ width, carrying comparatively barren quartz, with occasional pockets of rich ore assaying up to $55,000 per ton.

TRIMOUNTAIN MINING CO. **MICHIGAN.**

Office: 27 State St., Boston, Mass. Mine office: Trimountain, Houghton Co., Mich. Employs about 800 men. Organized 1899, under laws of Michigan, with capitalization $2,500,000, shares $25 par; $19 paid in. Annual meeting, second Wednesday in February. Wm. A. Paine, president; Frederic Stanwood, secretary and terasurer; F. W. Denton, general manager; preceding officers, Chas, H. Paine, Chas. A. Snow, J. Henry Brooks, John Stanton, directors; John Knox, assistant superintendent; John Jolly, mining captain; Edw. Koepel, mill superintendent; Benj. D. Noetzel, clerk; Jas. Vial, master mechanic; H. T. Mercer, engineer; Will Harris, supply clerk; Edw. Bates, master mechanic; Old Colony Trust Co., of Boston, registrar. Control of company was taken over by Copper Range Consolidated Co., which owns about 95% of the total stock issued, in September, 1903. Company paid dividends of $3 per share in 1903, first dividend being declared in February.

Official returns to the state of Michigan, as of date Jan. 1, 1903, disclose the following figures:

Amount cash paid in on capital stock	$1,200,000.00
Amount paid in by conveyance of property to company,	800,000.00
Entire amount invested in real estate	803,000.00
Amount of personal estate..........................	63,415.86

Lands, 1,120 acres, consisting of the east half of Section 19, west half of Section 20, north half of Section 29 and northeast quarter of Section 30, all in Town 54 North, Range 34 West. The Baltic lies to the north and the Champion to the south, with undeveloped lands east and west. The Trimountain has a very heavy sand overburden surmounting the ledge, hence it is no simple matter to sink shafts, which are opened by sinking drop-shafts through the sand and crosscutting to the lode, raising thence to surface on the angle of the lode. The Baltic bed runs 15′ to 50′ wide on the Trimountain tract, with an average width of about 25′, the lode being well mineralized across its entire width, mass and barrel copper occurring near the walls. Masses upwards of a ton in weight have been found, but principal values are in the stamp rock, which is of exceptional uniformity and richness. Shafts are all of the same size and style, being 8x22′ outside of timbers, with three compartments, framed with 14x14″ beams, exceptionally heavy timbering being required to withstand the pressure from the shifting sand above the solid rock. Development of the mine was begun in 1899.

Shafts 1, 2 and 3 have 2,500-h. p. Nordberg direct-acting duplex hoists with 36x72″ cylinders, and 18′ drums capable of raising 6-ton skips from a depth of 5,000′, and No. 4 is to have a similar hoist eventually. Shafts have duplicate shaft-rockhouses, 40x62′ on the ground and 84′ high, each equipped with engine, steam-hammer and two 18x24″ crushers, with room for two additional crushers of the same size, and 2,000-ton storage bins.

No. 1 shaft, 1,040′ deep, sunk at an angle of 68°, is about 210′ north of the Champion boundary line. This shaft has a sand overburden of about 40′, with first level opened 168′ below the collar, levels being 100′ apart from thence downward, developing a long stretch of exceptionally uniform stoping ground of high grade. Lying parallel with and about 65′ west from the Baltic lode is a very wide amygdaloid, carrying some heavy copper and considerable stamp rock. This has been opened by a crosscut from the 7th level of No. 1 shaft, and was explored to some extent during 1903, but nothing of great importance found.

No. 2 shaft, 1,023′ northeast of No. 1, is 976′ deep, and sunk at an angle of 68°, with practically the same equipment throughout as at No. 1.

No. 3 shaft, 1,027′ northeast of No. 2, sunk at an angle of 68°, is 930′ deep, with a sand overburden of about 60′. Ground is much disturbed above the second level, but the formation becomes more regular at greater depth, showing many good stopes. The shaft-rockhouse is a duplicate of those at shafts 1 and 2.

No. 4 shaft, 470′ deep, went into commission October, 1903. This shaft has a temporary hoist good for a depth of 1,300′, and is showing good ground.

Shafts 5 and 6 are in embryo. At the site of No. 5 is a sand overburden, mixed with boulders, 238′ in depth, which will prove costly and tedious to penetrate. No. 6 will develop the Trimountain territory to the Baltic line.

The principal mine buildings and machinery are in the neighborhood of shafts 2 and 3. The machine shop is 32x45′, carpenter shop 40x60′, smithy 25x45′ and warehouse 30x60′, the shops being supplied with modern machinery and tools. There is a 35-drill cross-compound Rand air compressor at No. 2 shaft, with a Deane condensing plant in a separate building adjoining. At No. 3 shaft the power plant is housed in a 68x180′ steel building, the plant including a 60-drill air compressor secured from the Arcadian, a Nordberg hoist and battery of Stirling water-tube boilers. There is a large coal-trestle, supplying fuel to the boiler-room, and a cistern at No. 2 shaft stores water from a small brook for the boilers. A house over the cistern has a fire pump, with hose, for defense of the mine buildings from fire.

The company has upwards of 100 good dwellings at the mine location, all new, also a large boarding-house and store. The location is growing rapidly and is improved with well macadamized roads. The mine is served by the Painesdale branch of the Copper Range railroad.

The 100-acre millsite at Beacon Hill, 2 miles west of Redridge, has about one mile frontage on Lake Superior. The mill is 176x205′, of steel on stone foundations, equipped with 4 Nordberg stamps, the washing machinery for each stamp consisting of 36 improved Hodge jigs, 6 slime tables and one Wilfley table. The mill has a small but complete machine shop for repairs on the second floor. The steel boiler-house has four 250-h. p. Stirling water-tube boilers, with a brick-lined self-supporting steel smokestack, 7′6″ in diameter and 165′ high. At the rear of the boiler-house are 3 coal trestles, under each being a 6x7′ tunnel 400′ long leading to the boiler-rooms, the floors of the sheds forming the roofs of the tunnels. Water is piped from a dam across a small stream 1,000′ distant.

The steel pump-house at the millsite has a 20,000,000-gallon Nordberg pump taking water from a well connected with a 40″ riveted steel pipe, running 1,400′ to an intake crib in Lake Superior. The crib, which is built of heavy timbers braced by iron rods, is 42x56′ on the bottom and 31′ high, sunk in 21′ of water, weighted with 1,800 tons of rock and anchored into the sandstone bed of the lake by heavy iron rods. The 40″ water pipe is laid on the floor of the lake from the crib until shallow water is reached, after which it lies in the bottom of a trench blasted to a uniform depth of 14′. The pipe is anchored between the crib and the end of the trench by cement sunk in sacks on each side. Miscellaneous buildings at the mill include smithy and carpenter shop, each 18x30′, and a 24x36′ warehouse. The townsite of Beacon Hill, lying on the slope above the mill, has a number of dwellings, the townsite and mill buildings being lighted by electricity supplied by a dynamo in the engine-room of the mill.

The Trimountain began production Jan. 4, 1902, with one leased head at the Arcadian mill, starting a second leased head in April. The first two heads in the Trimountain mill were started in 1902, and when the third and fourth heads were started in 1903 use of the Arcadian mill was discontinued. Production of refined copper was 5,732,160 lbs. in 1902, and 9,237,051 lbs. in 1903. The mill is crushing about 1,800 tons daily, but should eventually reach a capacity of nearly 2,000 tons, and owing to the magnificent development of the mine, additional stamping facilities will be required later. The management is thoroughly competent, and the property is one of the best in the Lake Superior district.

TRINITY COPPER CO. **CALIFORNIA.**

Office: 33 State St., Boston, Mass. Mine office: Kennett, Shasta Co., Cal. Organized 1900, under laws of New Jersey, with capitalization $6,000,000, shares $25 par; 160,000 shares listed on the Boston Stock Exchange. Thos. W. Lawson, president; Wm. Riley, vice-president; Homer Albers, secretary; Allen Arnold, treasurer; preceding officers, Louis Auerbach, Arthur P. French, Henry H. Arnold, Frank E. Chase and Kenneth K. McLaren, directors; Austin H. Brown, general manager; American Loan & Trust Co., of Boston, transfer agent; International Trust Co., of Boston, registrar.

Lands, 1,700 acres, also a 422-acre smelter-site and a patented townsite, near Kennett, giving a total area of 3,655 acres. Principal mining lands are the Shasta King and King Copper groups. The Shasta King group, 12 claims, is 4 miles east of Iron Mountain, on the south fork of Squaw creek, adjoining the Balaklala mine. Development is by tunnels, main tunnel being 7x8′ and 1,145′ long, with double tram-tracks. A 7x8′ double-track tunnel is also being driven 175′ lower. The mine has about 7,400′ of underground openings and the tract has been partially explored by 5,119′ of diamond drill borings. Ore body is a lense approximately 150′ wide by 1,000′ long, of unknown depth, giving evidence of strength and likely to prove persistent to good depth. The mine is claimed by the management to have upwards of 1,000,000 tons of ore in sight, with nearly 500,000 tons blocked out for stoping at the close of 1903. The crosscut tunnels, driven in from the sides of the mountain, are connected by drifts in the ore body. Ore is a low-grade disseminated chalcopyrite, averaging from 2% to 4% copper, with about $1 gold and silver values per ton.

The King Copper group of 22 claims, about 2½ miles south of the Shasta King, has about 1,000′ of development work, no ore having been found in place as yet. The Statesman group is being explored, with a view to locating and developing silicious ores required for fluxing. The Uncle Sam group, held under option and lease by the Trinity, is also being explored for fluxing ores, the Trinity having large bodies of low-grade cupriferous iron-sulphides but lacking the silicious ores required to make free-smelting furnace mixtures. Some oxidized ore has been found at and near surface, running 3% to 8% copper. Surface improvements include an office, assay office, hospital, warehouse, shops and about 25 dwellings for employes. The operating plant has steam power, a 6-drill air-compressor, power drills and one diamond drill. The smelter-site at Kennett is 8 miles from the mine, with which it is connected by railroad. Grading for 750-ton reduction plant was discontinued 1901.

The Trinity has a large body of ore, but this is of low grade, with silicious ores for fluxing still lacking. The property can be made a success only by working on a large scale. The mine is not yet in position to feed a smelter. Only a small force has been employed since 1901, and the annual statements of the company carefully conceal its true financial position.

TRIUMPH GOLD-COPPER CONSOLIDATED, SMELTING, LAND & IRRIGATION CO.

A fraud, promoted by the notorious Wernse gang of swindlers.

TROUT CREEK COPPER MINING CO,

Letter returned unclaimed from former office, Tacoma, Wash.

TROY COPPER CO. **ARIZONA.**

Succeeded by Troy-Manhattan Copper Co.

TROY GOLD MINING CO. **COLORADO.**

Mine office: Granite, Chaffee Co., Colo. G. Falconer, superintendent. Ores carry gold, silver and copper. Has steam power and 20-ton concentrator.

TROY-MANHATTAN COPPER CO. **ARIZONA.**

Office: 505 Postal Telegraph Bldg., New York. Mine office: Troy, Pinal Co., Ariz. Employs about 75 men. Organized July, 1902, under laws of Maine, with capitalization $3,000,000, shares $10 par; issued, $2,500,000. Present company is an amalgamation of the Troy Copper Co. and the Manhattan Copper Co., which had adjoining properties. John W. Sisson, president; Vincent P. Tommins, secretary; Chas. H. Cutting, general manager; Thos. Kavanaugh, superintendent. At annual meeting, April 28, 1903, company had a cash balance of $60,427.97, with 69,331 shares unissued, and was without accrued liabilities.

Lands, approximately 1,200 acres, are in the Troy district, with 5 claims more or less developed, principal work being on the Troy property, which includes the Alice and other groups, with aggregate area of 567 acres. The Troy has 4 shafts, including a 500′ two-compartment main shaft, with about 7,000′ of tunnels. The main working tunnel of the Alice is about 1,700′ long, and will intersect the lode at a depth of nearly 800′. It is planned to connect the mouth of this tunnel with the smelter by an aerial tram. Ores of the Alice are oxides and sulphides, ranging 8% to 16% in tenor, smelter returns for 1902 having given an average of about 10% copper. Vein is 3′ to 11′ in width, increasing at bottom of shaft, where it is very soft and requires spilling. The Sisson shaft shows a 6′ vein of sulphide ore, apparently a fissure in limestone, said to average about 5.5% copper. Equipment includes 2 gasoline hoists, a Leyner air-compressor and an electric plant.

The company's 60-ton smelter, at Riverside, on the Gila river, has been in operation intermittently since early in 1901, having experienced considerable trouble with shortages of both coke and water. It is planned to increase the smelting capacity to 250 tons daily on completion of the Phœnix & Eastern railroad, which should reach Riverside in 1904, and will prove a great benefit to the company, as the costly wagon haul of 75 miles has been a serious handicap in the past. The company is said to have expended about $500,000 in development and equipment, and the property is regarded as valuable, if given the railroad facilities absolutely necessary for its profitable operation.

TRUE BLUE COPPER MINES, LTD. BRITISH COLUMBIA.

Lands, 6 claims, on Houser Creek, Slocan, British Columbia.

TRUST RUBY MINE. COLORADO.

Letter returned unclaimed from former office, Ouray, Ouray Co., Colo.

TSCHOUDAK MINE. RUSSIA.

A small producer in the Russian Altai. Ore is chalcopyrite, with quartz gangue, in a vein ranging up to 24′ in width.

TSUBOI MINE, JAPAN.

Mine office: Tsuboi-mura, Kume-gori, Mimasaka, Japan. Ore is chalcopyrite, associated with iron pyrites, averaging 13% copper and 0.2% silver, occurring in three principal veins of 2′ to 4′ width, running parallel to plane of stratification of paleozoic clay-slate and schalkstein. Production in 1900 was 183,876 lbs. of refined copper.

TUBUTAMA MINING & REDUCTION CO. MEXICO.

Mine office: Tubutama, Altar, Sonora, Mex. Lands, 300 pertenencias, including a number of antiguas, adjoining the Sonora Mining & Milling Co. Property said to be promising.

TUCK MINE. VIRGINIA.

Undeveloped property in Halifax Co., Va. Fully described in Vol. II.

of wood, has one 42x120″ Allis-Chalmers water-jacket blast furnace of 250 tons daily capacity, with room for a second. The smelter has 800-ton ore bins, with central bottom discharge, emptying into cars running on rails into the smelter, where charging is done by hand. The furnace has a water-jacket forehearth for matte, slag discharging into a settler, thence into a sluice, where it is granulated and washed away by water. The dust-flue, 8x11x165′, arched over with corrugated iron, leads to a 90′ smoke-stack of 7′ diameter. The smelter also has a complete electric light plant.

The smelter, which burns coal, was blown in Dec. 16, 1902, and production in 1903 was 3,604,474 lbs. of refined copper, 121,932 oz. silver and 6,620 oz. gold. Production for 1904 will probably be about 4,500,000 lbs. of copper. The company netted a profit of £9,021 18s. 1d. for the year ending April 30, 1903, with all construction work charged directly to operating expenses, and smelter in operation only 107 days. The mine has been extensively developed, sufficient time having been taken to do the work thoroughly before production was begun, and as a consequence work is progressing smoothly and satisfactorily in every department. Owing to the excellent average grade of its ores, the financial strength of the company, and its sound, conservative management, the Tyee is a property of thoroughly demonstrated value, and has excellent prospects for long life and handsome profits.

TZAREVO-ALEXANDROVSKI WORKS. SIBERIA.

Office, mine and works: Semipalitinsk, Siberia. Mines are rather promising, though but slightly developed, and give an average annual production of about 250 tons of refined copper.

UDO MINE. JAPAN.

Mine office: Usagi-mura, Mikawa-gori, Izumo, Japan. Ores are chalcopyrite and bornite, accompanied by hematite and limonite, in a vein 3′ to 18′ wide and 320′ long. Was extensively worked, 1870-1881, but present production is trivial, vein being nearly exhausted.

UGURCHAISKA & GALIZURSKI MINES. RUSSIA.

Office: care of G. Chaimazidi, manager, Batum, Russia. Owned by Kunderov Bros. Mines are small producers, in the government of Elizabethpol.

UINTAH COPPER SUMMIT CO. UTAH.

Office: 25 Equitable Bldg., Boston, Mass. Mine office: Vernal, Uintah Co., Utah.

ULIDA GROUP. CALIFORNIA.

Office: care of Wm. L. Hunter, owner, Lone Pine, Cal. Lands, 8 prospects, in Inyo county, California, showing contact veins between limestone and granite carrying auriferous and argentiferous malachite and tetrahedrite, with occasional cuprite. Has made small smelter shipments of hand-sorted high-grade ore.

UNAWEEP COPPER MINING & SMELTING CO. COLORADO.

Office: care of James V. Howard, secretary, Grand Junction, Colo.

Lands, 6 claims and a millsite, in the Unaweep district, with a limited amount of development.

UNCLE SAM CONSOLIDATED MINING CO. UTAH.

Mine office: Eureka, Juab Co., Utah. Ores carry gold, silver, copper and lead. Has steam power and employs about 25 men.

UNCLE SAM COPPER CO. ARIZONA.

Office: 523 Douglas Bldg., Los Angeles, Cal. Mine office: Gilbert, Yavapai Co., Ariz. Milo Baker, president; W. T. Somes, secretary, treasurer and general manager. Organized July, 1901, under laws of Arizona, with capitalization $1,000,000, shares $1 par. Lands, 12 claims, area 240 acres, showing several ore bodies, of which one is being developed, this having an estimated width of 165′, opened by a 188′ shaft, giving assays of $20 to $40 per ton in copper, gold and silver, from oxide and sulphide ores, mainly the former, the latter being very rich in gold and silver. Property is 12 miles from the Santa Fe, Prescott & Phoenix railway.

UNION COPPER LAND & MINING CO. MICHIGAN.

Office: 60 State St., Boston, Mass. Local office: care of J. Abner Sherman, agent, Houghton, Mich. Reincorporated, 1893, under laws of Michigan, with capitalization $2,500,000, shares $25 par; issued, $2,000,000. Annual meeting, fourth Thursday in March. H. F. Fay, president; Geo. G. Endicott, secretary and treasurer; preceding officers, John C. Watson, Rogers L. Barstow, C. D. Coffin and Jas. Chynoweth, directors; Old Colony Trust Co., of Boston, registrar. Lands, about 200 different parcels, area upwards of 7,000 acres, practically all on the mineral belt, in Keweenaw, Houghton and Ontonagon counties, Michigan. Much of the land is covered with valuable timber, including pine, hemlock and hardwood, mainly the latter. Company had a cash balance of $83,856 on hand January 1, 1903. One tract of 240 acres, adjoining the Miskwabik, may be consolidated with the Miskwabik and Federal in a new mining company.

UNION COPPER MINING CO. CALIFORNIA.

Mine office: Copperopolis, Calaveras Co., Cal. David Ross, superintendent. Controlling stock interest is owned by estate of Fredk. L. Ames, of Boston. Lands include the Union, Keystone and Empire mines, also 2 claims adjoining the Alto in Del Norte Co., Cal. Mines were opened in 1861, and were considerable producers, paying fair dividends, circa 1861-1866. Formation is a black pyritous slate in amphibolite schists, this belt running from Tuolumne county on the south, through Calaveras into Amador county on the north. The vein of pyritous slate is 3′ to 40′ wide, with strike of 30° east of south and a dip of 30° to the east. Ore occurs as lenses of 15′ average width, connected by stringers, main lense being 2′ to 40′ wide and 600′ long. The alteration zone, about 30′ in depth, carries rich oxides and carbonates, and some native copper, below which occurs chalcopyrite carrying neither gold nor silver and unusually free from arsenic, antimony, bismuth and other undesirable elements. So pure is the ore that the blister copper therefrom makes good wirebars without electrolytic refining. Ore is classified in two grades, as smelting ore of 10% to 11% tenor, and leaching ore carrying

5% to 5.5% copper. Main shaft is 60′ deep, bottomed in a 15′ lense of medium-grade ore, and the mine has a mile of openings in ore. Equipment includes a good hoist, pumps, etc., with necessary mine buildings. A 100-ton Orford smelter, installed 1889, is not in blast, operations being confined to leaching the old dumps, which are extensive, with a force of about 20 men.

UNION COPPER MINING CO. **NORTH CAROLINA.**

Office: 11 Broadway, New York. Mine office: Gold Hill, Rowan Co., N. C. Employs about 50 men. Organized 1899, under laws of New Jersey, with capitalization $3,000,000, shares $10 par. Calvin H. Allen, president; Temple T. Berdan, secretary; John A. Traylor, superintendent.

Lands, about 1,150 acres, some 15 miles from Salisbury, in Rowan and Cabarrus counties, North Carolina, well watered and timbered, showing 13 copper veins and one vein each of gold, silver and lead, a little work having been done on the silver and gold veins. Principal mining developments are on the "Big Cut" copper vein, with 10 shafts, the 3 main working shafts being about 500′ deep each. This ore body carries a little native copper and oxidized ore in the upper portion, with chalcopyrite below, and is claimed to average 10% copper, 3 to 30 oz. silver and $1.50 to $7.50 gold per ton. Dr. A. R. LeDoux, however, found only 4% to 5% copper, 3 to 5 oz. silver and 40 cents to $1.20 gold per ton. The mine has a concentrator and smelter, planned to have ultimate capacities of 500 tons each. The smelter has roasters and two 40-ton blast furnaces, blown in September, 1901, and blown out June, 1902, since which time the mine has shipped concentrates only.

Machinery plant is extensive, though not well planned, including 27 boilers, 18 hoists, 3 air compressors and electric light plant. Property has four dams, with storage capacity for 3 months' operation, and a 25,000′ sawmill. Buildings include a concentrator, smelter, 45x75′ machine shop, 40x60′ smithy, iron and brass foundry, sundry engine and boiler houses, a stable for 400 horses and mules, office building, 52-room hotel and about 130 dwellings. Company's affairs have been badly handled in the past, but present management seems developing along more conservative and safer lines.

UNION COPPER MINING CO. **WYOMING.**

Office and mine: Encampment, Carbon Co., Wyo. Organized under laws of Wyoming, with capitalization $1,000,000, shares $1 par. Henry C. Hedges, president; A. E. Mosier, secretary. Lands, 100 acres, 3 miles from Encampment. Has steam power and limited development. Officers stand well, and property is considered promising.

UNION COPPER SMELTING CO.

A fraud, promoted by the notorious Wernse gang, of St. Louis.

UNION DEVELOPMENT CO. **CALIFORNIA.**

Property is the Juanita claim, in the Morrow district, 26 miles east of Johannesburg, San Bernardino Co., Cal., showing a contact vein between granite and limestone, carrying auriferous chalcopyrite with talcose gangue, opened by 4 shafts, deepest 212′.

UNION ORE EXTRACTION & REDUCTION CO. **COLORADO.**

Office: 828 Equitable Bldg., Denver Colo. Works office: 31st & Wewatta Sts., Denver, Colo. F. B. Spalding, president; Peter W. McCaffrey, vice-president and general manager; Wm. J. Smith, secretary. Has a plant using the Gardiner copper leaching and precipitating process, with daily milling capacity of 300 tons and leaching and precipitating capacity of 75 tons.

MINAS UNION Y CONSTANCIA. **MEXICO.**

Office and mines: Indé, Durango, Mexico. Reinaldo E. Avila, general manager. Country rock is andesite, showing 9 ore bodies carrying chalcopyrite, galena and spahlerite, associated with iron pyrites. One ore body under development averages 2 meters width and has been opened by a shaft of 18m. and tunnels of 70m. and 100m., giving first grade ore averaging 43% lead, 100 oz. silver and 54 oz. gold, and second grade ore averaging 4% copper and 20 oz. silver. Ores show a little native copper. Mines were opened by the Spaniards in the Sixteenth Century. Smelter, 4 miles from the mine, has two 30-ton water-jacket blast furnaces, shipping matte produced to the Aguascalientes works for conversion and refining. The management contemplates deepening main shaft 50m. and adding a hoist and gas producer in 1904.

UNITED ALKALI CO., LTD. **SPAIN.**

Offices: St. Helens, England. Mine office: Huelva, Spain. Wm. Guthrie Bowie, mine manager. Capital, £8,750,000. Company is a chemical and manufacturing corporation, with which copper mining is merely a small branch of the general business. Has large works at St. Helens, Runcorn, Flint, Widnes and Glasgow, making extensive use of Spanish and Portuguese pyrites, which are burned for sulphur, the cinder of the cupriferous pyrites being leached for copper. The principal copper holdings of the company are the Monte Rubio group, held under lease from C. & J. Sundheim, this including the Monte Rubio, Gibraltar and Atbalcal Arbalcal mines, having a combined area of about 100 hectareas. These are ancient properties, worked only to the level of the nearest stream in the Roman era, these old workings, though comparatively superficial, disclosing enormous masses of ore, occurring as oxides, carbonates, sulphides and sulphate, with iron ore gangue, indicating the existence of large bodies of unaltered iron-copper sulphides at greater depth. Company also has sundry undeveloped mineral leases on the river Guadiana, and plans building a 22-kilometre railway from Monte Rubio to Coiña Veral, on that river, and constructing wharves at the latter point for shipping ore to Great Britain.

UNITED COPPER CO. **MONTANA.**

Offices: 31 Nassau St., New York and 26 Equitable Bldg., Boston, Mass. Mine office: Butte, Silver Bow Co., Mont. Employs approximately 1,600 men, though subsidiary mining companies. Organized Apr. 28, 1902, under laws of New Jersey, with capitalization $80,000,000, in $5,000,000 of 3% preferred stock and $75,000,000 common stock, par $100, of which all the preferred, and 450,000 shares of common have been issued. Said to have begun business May 1, 1902, with $600,000 cash surplus. F. August Heinze, president; Arthur P. Heinze, first vice-president; John MacGinnis, second vice-president; Stanley Gifford, secretary and treasurer; F. A. Heinze, John MacGinnis, Stephen E. Nash, A. A. Brownlee, Hugo Blumenthal, A. P. Heinze, Jacob Langeloth, Frederick W. Whittridge and G. Reusens, directors; Hallgarten & Co., of New York, transfer agents; Metropolitan Trust Co., of New York, registrar. Common stock is listed on the Boston exchange.

The United Copper Co. is a securities holding corporation solely, organized on the same general lines as its great rvial, the Amalgamated Copper Co. F. August Heinze and his associates in the Montana Ore Purchasing Co. are credited with holding considerably more than a controlling interest of the stock issue. The United Copper Co. began business as the owner of 76,791 shares of stock of the Montana Ore Purchasing Co., 123,500 shares of Nipper Consolidated Copper Co., 950,000 shares of the Belmont Mining Co., 1,900,000 shares of Cora-Rock Island Mining Co., and 2,950,000 shares of Minnie Healy Mining Co., this being 95% of the stock issue of each company named. The United Copper Co. also owns the entire issue of $1,000,000 first-mortgage bonds of the Montana Ore Purchasing Co. and the entire issue of $2,500,000 first-mortgage bonds of the Nipper Consolidated Copper Co. The principal value of these holdings lies in the stock of the Montana Ore Purchasing Co., which, with its various subsidiary corporations, is engaged in extensive litigation with the Amalgamated Copper Co., there being nearly 100 separate actions at law between these corporations, with no seeming possibility that the litigation will ever be ended, except by the collapse of one of the companies or by mutual agreement outside of the courts. The Johnstown and Rarus mines of the Montana Ore Purchasing Co. adjoin the Pennsylvania mine of the Boston & Montana Co., controlled by the Amalgamated, and the titles and affairs of all these companies are involved in a hopeless fog of litigation.

Production of refined copper by the subsidiary companies of the United Copper Co. was about 28,500,000 lbs. in 1903, and for the year ending June 1, 1903, profits of the various subsidiary corporations were $601,250. Dividends paid in 1903 were $450,000. Productive capacity of the various mines controlled by this company is about 3,000,000 lbs. per month, when working full forces.

UNITED COPPER-GOLD MINING & EXTRACTION CO. **ARIZONA.**

Dead. Property absorbed by Eagle Copper-Gold Mining & Milling Co.

UNITED GOLD & COPPER CO. **NEW MEXICO & CALIFORNIA.**

Office: 801-159 La Salle St., Chicago, Ill. Branch offices: New York, Columbus, Ohio and Santa Fe, N. M. Mine office: Lordsburg, Grant Co., N. M. Organized 1902, under laws of New Mexico, with capitalization $5,000,000, shares $1 par. R. M. Wilbur, president; W. F. Weyburn, secretary; Wilson I. Davenny, assistant secretary; D. A. Walker, treasurer. Lands are in New Mexico and California. New Mexico holdings are 4 groups, area 400 acres. The first group, about 5 miles from Santa Fe, shows auriferous and argentiferous oxide and carbonate ores of copper. The second

New Mexican group of 7 claims, area 140 acres, is in the Gallinas district of Lincoln county, showing a dike ranging 10′ to 100′ in width carrying copper, gold and silver. The third New Mexican group is 4 claims, area 120 acres, in the San Andreas district of Socorro county, showing two large fissure veins giving good assay values in copper, lead, silver and gold. The fourth group of 5 claims, area 100 acres, is in the Shakespeare or Virginia district of Grant county, and is being developed. Company is also opening gold mines in the Cherokee district, about 10 miles from Oroville, Butte county, California, on 8 claims, area 100 acres, carrying gold placers and a quartz lode, latter having an 800′ tunnel and about 1,700′ of underground openings. California property is well spoken of, but company has been paying dividends and selling stock simultaneously, which is a policy that cannot be too strongly condemned.

UNITED GOLD & COPPER MINING CO. COLORADO & NEW MEXICO.

Office: 32 Broadway, New York. Mine office: Turret, Chaffee Co., Colo. Capitalization $1,500,000, shares $1 par. Has mining claims in the Turret district of Colorado and near the Santa Rita mines in New **Mexico,** and prints very alluring advertisements about what it intends doing.

UNITED METALS SELLING CO.

Office: 11 Broadway, New York. Organized 1899, under laws of New Jersey, with capitalization $5,000,000, shares $100 par. Dividends were 10% in 1902. Jesse Lewisohn, president; Urban H. Broughton, treasurer and general manager. The company does a general brokerage business in metals, the great bulk of its trade being in copper, of which it is much the largest sales-agent in the world. Is closely affiliated with the Amalgamated Copper Co.

UNITED MINING & DEVELOPMENT COMPANY OF AMERICA. CALIFORNIA & MEXICO.

Office: 66 Broadway, New York. Capitalization $10,000,000, shares $10 par. John Thomson, president; John R. Stanton, vice-president; T. C. Martin, secretary; E. F. Phelps, treasurer; Albert Freeman, general manager. Is a promotion and development company, formed to open and finance mines along much the same lines as the Venture Corporation of London. Holdings include 40 acres, known as the King Solomon mine, at Valley, Galaveras county, California, and the Nevada de las Miches mine, of 107 pertenencias, area 264 acres, in the Fuerte district of Sinaloa, Mexico. The California property has about 2,000′ of underground openings, giving assays of $12 to $15 per ton, in gold and copper. A little development has also been secured on the Sinaloa property.

UNITED ARIZONA COPPER CO., LTD. ARIZONA.

Offices: 38, Broad Street Ave., London, E. C., Eng. Rt. Hon. Earl of Orford, chairman; W. P. Guthridge, mine manager; J. F. Shearer, secretary. Capital, nominal, £200,000; issued, £160,000. Lands, 500 acres in Pinal county, Arizona, bought for £160,000, cash, carrying auriferous and argentiferous copper ores. Main shaft is 600′. Has developed considerable ore bodies. Equipment includes 30-ton smelter and leaching plant; erection of

100-ton smelter contemplated. Ore smelted in the past is said to have averaged 9% copper, with considerable gold and silver values.

UNITED BINGHAM GOLD & COPPER MINING CO. UTAH.

Office: Salt Lake City, Utah. Mine office: Bingham Canyon, Salt Lake Co., Utah. Louis Moore, president; Adrian Hanauer, Jr., secretary; Harry Joseph, superintendent. Lands, several acres, patented. Is developing by the Snowstorm tunnel, which has opened a 4′ vein assaying 2% copper, 25% lead and up to $8 gold per ton.

UNITED BUFA MINES. MEXICO.

Office: 1 Exchange place, Jersey City, N. J. Organized 1903, under laws of New Jersey, with capitalization $300,000, shares $1 par, to mine copper and other ores in Mexico.

UNITED GERMAN COPPER MINES, LTD. GERMANY.

Letter returned unclaimed from former office in London. Lands of company were at Münster-am-Stein, Bavaria, Germany.

UNITED GLOBE MINES. ARIZONA.

Office: 99 John St., New York. Mine office: Globe, Gila Co., Ariz. Jas. Douglas, president; Geo. Notman, secretary and treasurer; Niles S. Berray superintendent. Capitalization said to have been increased in 1903 from $1,300,000 to $2,300,000. Lands, 20 patented and 9 unpatented claims lying next west of the Old Dominion group, also 3 millsites, in the Globe district. Mine is extensively developed and very wet, having a 765′ 3-compartment main shaft, showing an ore chute 30′ wide and 700′ long on the 7th level, averaging 4% and upwards in copper. Ore bodies are extensive but erratic, and ore is highly silicious, requiring heavy fluxing. Leasers have shipped ores averaging 20% copper and 1 oz. to 15 oz. silver per ton, but the high-grade ore made by the company averages about 14% copper. Mine has a 200-ton smelter and made 830,000 lbs. of refined copper in 1901, but since idle. Largest production was 4,451,180 lbs. in 1899. The mine is prepared to produce about 200 tons of ore daily, and this output could be increased at a pinch. Property is to be operated under a close working agreement with the Old Dominion mine, details of this arrangement being given in the description of the Old Dominion Company.

UNITED MEXICAN MINING & SMELTING CO.

Stock in this corporation is being peddled by the notorious "Rev." C. E. Nylin, of the Laborers Co-operative Gold, Silver and Copper Mining Co.

UNITED RICO MINES CO. COLORADO.

Mine office: Rico, Dolores Co., Colo. Percy S. Rider, superintendent. Ores carry gold, silver, copper and lead. Has steam and electric power, mill with 20 stamps and 3 Huntington mills, and 100-ton smelter, employing about 50 men.

UNITED STATES GOLD INCORPORATION. COLORADO.

Mine office: Eldora, Colo. John F. Rowell, general manager. Lands, 300 acres. Plans to develop claims in the Arapahoe copper-gold belt by tunnel.

UNITED STATES MINING CO. UTAH.

Office: 4 Post Office Sq., Boston, Mass. General Utah office: 508 Dooly

Blk., Salt Lake City, Utah. Mine offices: Bingham Canyon, Salt Lake Co., Utah, and Tintic, Juab Co., Utah. Organizd 1899, and reorganized 1901, with capitalization $21,500,000, shares $25 par, of which 412,637 shares, or slightly more than one-half of the authorized capital, are issued. Company has an authorized bond issue of $600,000, of which only $75,000 of first-mortgage bonds are outstanding. Robert D. Evans, president; W. H. Coolidge, vice-president; Albert F. Holden, managing director; F. W. Batchelder, secretary and treasurer; C. E. Allen, general superintendent; H. K. Masters, smelter superintendent; T. R. Jones, manager custom ore department; Richard A. Parker, consulting engineer; Aron Hirsch & Sohn, sales agents, represented in the United States by L. Vogelstein, of New York.

The mines of the company are in two groups, one at Bingham and one at Tintic. The properties at Bingham, which were the original holdings of the company, include the Telegraph, Old Jordan, Niagara, Commercial and adjoining claims. The Niagara, which is apparently of the least importance, is held through a stock interest, and minority stockholders have fomented more or less litigation. The Telegraph and Old Jordan were originally silver mines, opened on a fissure vein of silver-lead ore crossing the big sulphide copper dyke from which the present production is secured. The copper ores are silicious and deficient in iron, but in connection with the iron-sulphide ores of the Tintic group furnish a good furnace mixture. The Bingham ores range in tenor from 1.5% to 2% copper, with 2 to 5 oz. silver and $1 to $2.50 gold per ton. The Old Jordan and Telegraph ores are said to be giving smelter returns of 26 to 28 lbs. copper and $2 to $2.50 gold and silver per ton.

The deepest workings at Bingham are about 400′ only, with about 5 miles of openings on the Old Jordan group, developing a large amount of ore. The Galena mine, now being reopened, is developed to a depth of 235′ and produced upwards of $1,000,000 under previous ownership, the records showing average smelter returns of 20% lead, 25 oz. silver and up to $10 gold per ton. The aerial tramway taking the ore from mines to railway is supposed to have a capacity of 25 tons per hour, but has given much trouble by frequent breakages. Couplings throughout have been replaced by heavier castings, and no further serious trouble is anticipated.

The Tintic group includes the Centennial-Eureka and Tintic mines, control of the Centennial-Eureka, which has been a large dividend payer in the past, being held through ownership of all but about 100 shares of the capital stock. The Tintic properties are old mines and have been opened to about 1,500′ depth. The ore is found in two grades, the oxides and carbonates carrying high values in gold and silver and ranging from $10 to $30 per ton in value, with upwards of 150,000 tons developed. The low-grade deposits are of enormous extent but carry only small gold and silver values. The main shaft, 1,500′ deep, was thoroughly retimbered and stoping begun in September, 1902. The mine is shipping about 250 tons of ore daily, with ore reserves of about 500,000 tons, and smelter shipments are said to average $23 per ton in values, and all ores of the company $12 to $13 per ton in gross values. The various mines of the United States company have about

2,000,000 tons of ore blocked out for stoping, of which about 90% is low-grade, this being sufficient for about 5 years' requirements. The mines are well equipped with hoisting and other machinery.

The smelter, on a 150-acre tract in the neighborhood of the works of the Utah Consolidated and Bingham companies, was planned by Geo. K. Fischer, and erected under his supervision, the plant being designed for automatic handling of material as far as possible. The structure is designed for 6 furnaces, and at the close of 1903 had four 250-ton furnaces in blast. The pyritic system is employed, ore being reduced in blast furnaces without previous roasting, producing converter matte in two blows, the ore being smelted to a 20% to 22% matte in the first fusion and blown up to 40% to 50% in tenor in the second blast, going thence to the converters. Blister copper is sent to the Delamar works at Carteret, New Jersey, for electrolytic refining. The smelter has electric traveling cranes, electric light, briquetting plant and silica mill, and it is planned to erect a lead furnace in the near future. The smelter buys considerable custom ore for fluxing. The plant has given some trouble in operation, but minor difficulties seem to have been corrected, although the furnaces are now fed by hand, automatic feed having proven unsuccessful, for reasons not clearly understood.

Production of the United States for 1903 was approximately 10,000,000 lbs. of refined copper. The year was ended in good financial condition, and the mine should be able to pay its first dividend in 1904. The company seems to have been a target for considerable unnecessary criticism, but despite a number of minor troubles, frequently incidental to the opening of a new property, is securing good results and has excellent prospects.

UNITED STATES MINING & SMELTING CO. MEXICO.

Office: 6 Wall St., New York. Capitalization $5,000,000. Joseph Gray Kitchell, president; Henry Vooree Brandenburg, treasurer; Thos. B. Johnson, superintendent. Said to own the San Jose de Gracia, sometimes called the Ajogada mine, 45 miles from Hermosillo, Sonora, Mexico.

UNITED STATES REDUCTION & REFINING CO. COLORADO.

Office: 54 Wall St., New York. Works office: Colorado Springs, El Paso Co., Colo. Chas. L. Tutt, president; Chas. M. MacNeill, first vice-president and manager; Spencer Penrose, secretary and treasurer. Organized May 31, 1901, under laws of New Jersey, with capitalization $10,000,000, in $4,000,000 non-cumulative 6% preferred and $6,000,000 common stock, paying 1½% quarterly dividends in 1902 and 1903 on preferred stock and 1% quarterly dividends on common stock. Has extensive refining plants at Colorado City, Florence and Canyon City, Colorado.

UNITED STATES & GUERRERO EXPLORATION CO. MEXICO.

Office: Ashland, Ky. Capitalization $1,000,000. Dr. J. Letton Marin, president. Lands, 148 acres, in the states of Michoacan and Guerrero, Mexico.

UNITED STATES & MEXICAN MINING CO. MEXICO.

Office: 42 Murray St., New York. Mine office: Hostotipaquillo, Jalisco, Mex. Isaac P. Martin, manager. Lands include the Trinidad and Guadalupe mines, carrying gold, silver, lead and copper ores. Has water power and employs about 100 men.

UNITED VERDE COPPER CO. ARIZONA.

Office: 49 Wall St., New York. Mine office: Jerome, Yavapai Co., Ariz. Employs 1,000 men. Organized Sept. 11, 1899, under laws of West Virginia, with capitalization $3,000,000, shares $10 par; issued, $2,999,270. Present company succeeded old corporation of same title organized under laws of New York. Debentures, $3,000,000 authorized; $2,998,800 issued, payable 1949. Annual meeting, third Monday in February. Is conducted as a close corporation, Senator Clark being supposed to own about 90% of the capital stock. Wm. A. Clark, president; Jas. A. MacDonald, vice-president; Chas. W. Clark, general manager; preceding officers, Henry G. Atwater and Jas. Kitchen, directors; J. C. Kennedy, secretary and treasurer; W. L. Clark, assistant superintendent; Robt. Mitchell, smelter superintendent; Otto Strodhoff, chief clerk; Geo. Bosch, master mechanic.

Lands, 13 claims, area 250 acres, with sundry adjoining lands, in the Verde district of the Black Hill range, at an elevation of 5,600′ above sea-level and 1,800′ above the valley of the Verde river. The United Verde was originally a small gold and silver mine, until bought by Senator Clark in 1888. The mine is in a zone of slates and intrusive dioritic rocks, the neighboring limestone being unconformably superimposed and apparently having no connection with the ore deposits. The mine is opened on a single monstrous lense of sulphide ore, in slate, the lense having a dip of 72°, and being intruded by a quartzite dyke 70′ wide carrying about 1% copper and 1 to 13 oz. gold per ton, ore from which is used for converter linings. The gossan outcrop, carrying auriferous and argentiferous oxide and carbonate ores to a depth of about 160′, has been largely worked out. The zone of secondary enrichment carries mainly chalcocite, with some covellite and other alteration minerals of copper, all highly argentiferous. The unaltered ores, mainly chalcopyrite, with a little bornite, are both auriferous and argentiferous. In mining no assortment is made and no concentration attempted, everything from the mine openings going to the furnaces, the average of the ore taken from the openings being about 7% copper. The ore is very rich in sulphur and much heat is generated in the stopes, spontaneous combustion being frequent. Access to the mine is secured with extreme difficulty and only upon a written order from Senator Clark, such orders being very uncommon, and employes are cautioned against giving out information. Underground openings are very extensive, with enormous ore reserves, estimates of ore in sight varying greatly, and ranging up to 20,000,000 tons, containing about 1,500,000 tons of pure copper. This ore is developed above the 700′ level and diamond drill borings show ore to a depth of 2,000′. It is not known that the ore is leaner at that depth, but in all likelihood there is a material decrease in all metallic values at depth. The lense is at least 1,900′ long, and has an extreme width of 600′. The mine is worked pillar-and-stall, and timber, when used, is placed as square sets. Worked-out stopes are filled with barren rock, blasted from the mountain side above the mine, and milled cost of treatment probably not exceeding $5 per ton. The mine is also accumulating large reserves of high-grade ore, and is in an exceptionally strong position financially and otherwise, with an excellent management, bidding fair to make one of the largest and most profitable of American copper mines.

UTAH COPPER CO. **UTAH.**

Office: Colorado Springs, Colo. Mine office: Bingham Canyon, Salt Lake Co., Utah. Organized June, 1903, being a close corporation controlled by leading officials of the United States Reduction & Refining Co. It is said to have paid upwards of $1,000,000 for its property. Chas. N. MacNeill, president; Spencer Penrose, secretary and treasurer; D. C. Jackling, general manager; preceding officers, R. A. F. Penrose and Chas. L. Tutt, directors.

Lands, 100 acres, lying on both sides of Bingham Canyon, formerly owned by the De Lamar-Wall Mining & Smelting Co., also 320 acres bought 1903 from the West Mountain Placer Co. for $75,000, and a 320-acre millsite near Garfield Beach, Saltair, Great Salt Lake, this site being 10 miles north of Bingham, with which it is to have rail connections. The Saltair property has several good springs, one with a flow of 3,000 gallons per minute, giving a water supply adequate for a 3,000-ton concentrator. Mining lands have been developed by tunnels of 400′ to 600′ on either side of the gulch, these tunnels aggregating about 4,000′ in length. Property also has been extensively tested with drill holes. Country rock is a soft, friable porphyry, the ore being disseminated chalcopyrite, said to average about 2.3% copper, 0.5 oz. silver and 0.03 oz. gold per ton. It is planned to mine in terraces, the ore body being of enormous size, with possible use of a steam shovel, eventually.

A 400-ton concentrator, near the mine, was begun in 1903. This is located about 1½ miles below Bingham and will receive ore by rail. There is an adequate water supply for a 2,000-ton mill, and the 400-ton plant should be in operation in the spring or summer of 1904. It is estimated that this mill can put about 10 tons into 1, with a saving of 80% to 85% of values, at a cost of 60c. per ton. It is also planned to ultimately build a concentrator of 2,000 tons or 3,000 tons capacity at Saltair.

The success of this company will mean much to the future of Utah copper production. The ore deposits are of immense size, but of a grade hitherto untouched, because considered too lean to work at a profit. The Utah Copper Co. is composed of some very strong people, who are not theorists, but practical miners and metallurgists, with a record of continuous success in other fields.

UTAH APEX MINING CO. **UTAH.**

Office: care of Walter C. Orem, general manager, Salt Lake City. Mine office: Bingham Canyon, Salt Lake Co., Utah. Organized under laws of Maine, with capitalization $2,500,000, shares $5 par. E. R. Hastings, president; J. W. Hane, treasurer; Count Reginald Ward, British agent, 65, London Wall, London, E. C. Property was originally the New York and Copperfield groups, to which the Dana, Petro, and Highland Boy Consolidated groups have been added, giving a total of 21 claims, area about 160 acres, advantageously located in Carr Fork, Bingham or West Mountain district. The various properties contained in the consolidation have produced about 300,000 tons of chalcopyrite, galena and lead carbonate ores in the past. Development is by 3 tunnels, with about two miles of underground openings. Attention is being confined to opening the mines on a considerable scale, and this property promises to become, in time, one of the large producers of the Bingham camp.

UTAH & BOSTON COPPER CO. **UTAH.**

Dead. Property sold to pay debts.

UTAH & EASTERN COPPER CO. **UTAH.**

Office: 42 Church St., New Haven, Conn. Mine office: Shem, Washington Co., Utah. Organized February, 1901, under laws of West Virginia, with capitalization $1,500,000, shares $5 par. Chas. E. Graham, president; Louis E. Stoddard, secretary and treasurer; Chas. H. Doolittle, general manager. Lands, 11 patented claims, area 220 acres, including the old Dixie mine, also a 40-acre smelter-site, in the Tutsagubet district, showing 5 fissure veins, with estimated average width of 40′, giving average assays of 15% copper from oxide and carbonate ores. Principal development is by a 775′ blind shaft, sunk from breast of a 225′ tunnel, giving about 100,000 tons of ore in sight. Has steam and water power at smelter, and gasoline power at mine, with a good mining equipment. The old 25-ton smelter, inconveniently located, is idle, and a new 50-ton smelter is in blast, making 5 tons of blister copper daily, and is to be doubled in capacity. A 2,200′ gravity tram will be installed. Production of refined copper in 1903 was 1,550,000 lbs., made in 177 days smelter run, and production for 1904 is expected to be about 3,500,000 lbs. Property is conservatively managed and valuable, with good prospects.

UTAH-NEVADA GOLD & COPPER MINING CO. **UTAH.**

Office: care of David Jensen, Ogden, Utah. Organized 1903, with capitalization $400,000, shares $1 par. Lands are in Box Elder and Weber counties, Utah.

UTAH QUEEN MINE. **UTAH.**

Mine office: Bingham Canyon, Salt Lake Co., Utah. Morris R. Hunt, superintendent.

UTICA MINING & MILLING CO. **COLORADO.**

Office: 1420 Chestnut St., Philadelphia, Pa. Mine office: Ward, Boulder Co., Colo. G. A. Davison, superintendent. Ores carry gold, silver and copper. Has water power and 20-stamp mill.

VAL CASTRUCCIO MINES. **ITALY.**

Mine office: Massa Maritima, Grosseto, Italy.

VAL D'ELSA COPPER CO., LTD. **ITALY.**

Offices: 122, Wellington St., Glasgow, Scotland. J. McFarlane, chairman; J. Morton, secretary. Capital, nominal, £75,000; issued, £44,505. Lands, 12 square miles, near Gambarri, Val d'Elsa, Italy, held subject to 6% royalty on production.

VAL VERDE COPPER CO., LTD. **ARIZONA.**

Office: 11 Broadway, New York. Mine office: Val.Verde, Yavapai Co., Ariz. Employs about 75 men. Organized 1899, under laws of Arizona, with capitalization $600,000, shares $5 par. M. F. Murphy, president; John L. Davis, secretary and treasurer; Cecil G. Fennell, general manager; S. E. Bretherton, superintendent. Lands, 80 acres, in the Francis district of Coconino county, Arizona, also 600 acres of miscellaneous lands, with 4 shafts, deepest 200′, and about 2,000′ of underground openings, showing lenses carrying sulphides ores of good assay value. Company also holds the Gladstone mine, near Val Verde, under bond and lease.

The smelting plant, on the Agua Fria river, 18 miles west of Prescott, does a strictly custom business. The plant has 250 tons daily capacity, with one round furnace and one rectangular matting furnace, the latter being equipped with a Bretherton hot-blast stove, which heats the blast to a temperature of 350° to 400° Fahrenheit before entering the tuyeres. The Bretherton stove, built at a cost of $3,000, enables the smelter to dispense with roasters. The ores treated are very base, being low-grade silicious sulphides, averaging 1.5% copper, with upwards of 1% arsenic and carrying large percentages of sulphur, zinc and lead, but all of the arsenic and most of the zinc and lead are volatized by the hot blast. Small coke charges are used, the process being semi-pyritic, and the stove is fired with discarded railroad ties and cedar wood, at an average cost of $9 daily for fuel, as compared with an estimated cost of $156 for coke. The product is a clean matte of 45% to 50% in copper tenor, rich in gold and silver, containing neither arsenic nor antimony and carrying very small percentages of lead and zinc. Excellent concentration is accomplished by once remelting the matte with silicious ores. The company states that 1% copper ores have been treated profitably in its furnace, and the results secured would indicate that the Bretherton hot-blast semi-pyritic process has a large field of usefulness in the reduction of certain low-grade basic sulphide ores.

The company has a short railroad line and controls the townsite of Val Verde, maintaining water works, electric light, lodging-house and boarding-house, but excluding saloons. Production of refined copper in 1903 was 379,639 lbs. Management of the company, which was practically reorganized in 1902, is composed of men of experience and good standing.

VALDEZ, COPPER RIVER & YUKON RAILWAY CO. ALASKA.

Is being promoted by the notorious L. E. Pike & Co., of 17 Milk St., Boston, who advertise that "eastern capitalists have subscribed enough to insure the building of the road, which will cost about $25,000,000, and that contracts have been let to Jas. B. McDonald & Co., of New York, who agreed to complete the road in 14 months." It so happens, however, that the contract to McDonald & Co. was let at $26,000 per mile, for about 400 miles, of road, making a total cost of approximately $10,400,000. Other claims of Pike & Co., who have been identified with numerous unsavory promotions in the past, are of a piece with their statement regarding the cost of the line.

VALENCIA COPPER MINING CO. CALIFORNIA.

Office: Hayward Bldg., San Francisco, Cal. Letter returned unclaimed from former mine office, Sherwood, Trinity Co., Cal. Organized under laws of Arizona, with capitalization $1,000,000, shares $1 par. Chas. E. Laumeister, president; J. E. Manning, secretary and treasurer; F. P. Burris, superintendent. Lands, 12 copper claims, area 248 acres, also 3 quartz-gold claims, area 62 acres, and 250 acres of placer-gold claims, all well watered and timbered, on the East Fork of New River, near the summit of the Trinity-Salmon range. The copper claims carry a heavy gossan capping and are opened by 2 tunnels. Company has extensive water-rights, including two falls of 150′ each.

SOCIEDAD VALENCIANO-ANDALUZA DE ALTOS HORNOS Y MINAS DE PENAFLOR. **SPAIN.**

Office: Glorieta, 1, Valencia, Spain. Mine office: Penaflor, Sevilla, Spain. Don Nordal Preus, manager. Was developing copper and iron deposits at last accounts.

VALENSUELLA COPPER CO. **ARIZONA.**

Office: 3543 W. 23d Ave., Denver, Colo. Mine office: Quartzite, Yuma Co., Ariz. Employs 16 men. Organized November, 1901, under laws of Arizona, with capitalization $1,250,000, shares $1 par. Richard Darling, president and superintendent; Geo. C. Foulkes, secretary. Lands, 5 claims, area 100 acres, also a 60-acre mill and smelter site, in the Quartzite district. Country rocks are limestone and schists, showing 2 contact veins, developed by shafts of 200′ and 270′, giving average assays of 12% copper, 4 oz. silver and $4 gold per ton, from malachite, azurite and oxide ores. Has 1,050′ of underground workings, showing ore bodies of considerable size. Has gasoline power, with 2 hoists, good for depth of 500′ each, 2 engine-houses and smithy, each 18x24′, and 6 dwellings. Is building a 25-ton smelter at the mine. Property is 70 miles from the Southern Pacific railroad, and 15 miles from steamer landing on the Colorado river, supplies being received by water.

VALEO MINING CO. **UTAH.**

Mine office: Park City, Summit Co., Utah. Hon. Thos. Kearns, general manager: J. P. Boyle, superintendent. Ores carry gold, silver and copper. Has steam power and employs 20 men.

VALERIE MINE. **YUKON.**

A Yukon property by this name is said to have made a small shipment of copper ore to the Crofton smelter, early in 1903.

MINA VALLENARINA. **CHILE.**

Office and mine: Taltal, Antofagasta, Chile. Pedro Herrera, owner and manager. Employs about 25 men.

VALLEY MINING CO. **COLORADO.**

Office: Iowa City, Ia. Mine office: West Cliff, Custer Co., Colo. Employs 15 to 60 men. Chas. S. Magowan, president; John I. Christie, secretary; Saml. E. Palmer, general manager; F. L. Card, superintendent. Organized under laws of Colorado, with capitalization $150,000, shares $1 par. Lands, 6 patented claims, area 72 acres, also a 20-acre millsite, in the Silver Cliff district, with 6 veins of 2″ to 2′ width, opened by shafts of 175′ and 280′, with 1,300′ of underground openings, securing average assays of 2.5% copper, 17% lead, 1% zinc, 10 oz. to 13 oz. silver and $4 gold per ton, from oxidized ores with occasional native copper. Has a 75-h. p. steam plant at mine, with 2 hoists and an air-compressor, and a 60-ton concentrator, 50x175′, of brick and wood, with a 150-h. p. steam plant, 18″ Blake crusher, 2 trains of rolls, 6 Card concentrating tables, 2 sizers and 500′ of canvas slime tables.

VALLEY VIEW MINING CO. CALIFORNIA.

Office: San Francisco, Cal. Mine office: Lincoln, Placer Co., Cal. Lands, 90 acres, patented, showing impregnations 250′ wide, with about 25′ of ore between schistose walls. Has an auriferous and argentiferous gossan outcrop, nearly 100′ wide and 1,000′ long, averaging $4 per ton. Ore shipped averages about 5% copper. Has two 5′ Huntington mills.

VALLEY VIEW MINING CO. . MONTANA.

Letter returned unclaimed from Anaconda, Deer Lodge Co., Mont.

VALRUBIO GROUP. SPAIN.

Offices: care of M. Yglesias, owner, 2, Tokenhouse Bldgs., London, E. C., Eng. Mine office: Paimogo, Huelva, Spain. Property includes the Valrubio, San Carlos and San Andres mines, with total area of about 200 acres, these being the western extensions of the San Vicente veins, and lying between the Romanera and Monterubio groups.

VAN ANDA COPPER & GOLD CO., LTD. BRITISH COLUMBIA.

Property leased to the Van Anda Mines & Smelter.

VAN ANDA MINES & SMELTER. BRITISH COLUMBIA.

Office and mines: Van Anda, Texada Island, B. C. Employs about 60 men. T. J. Vaughan-Rhys, general manager. Is held under lease from the Van Anda Copper & Gold Co., Ltd., since July, 1902. Lands, 20 claims, area 840 acres, in the Nanaimo district, including the Copper Queen and Cornell mines, opened by shafts of 80′, 150′, 460′, and 500′, with tunnels aggregating about 4,000′ in length, and with a total of about 12,000′ of underground openings. Has bornite and chalcopyrite, estimated to average about 8% copper, 2.5 oz. silver and $1 gold. Has a steam plant, with 3 hoists, a 5-drill Rand compressor, 5 pumps and power drills, a sawmill with daily capacity of 20,000′, warehouse, and substantial shipping wharf. Reduction plant, one mile from the mines, and connected therewith by tramway, has a 50-ton circular furnace and 75-ton rectangular furnace, with sampling mill, crushers, etc. Smelter is idle and ore is shipped to the Crofton smelter. Production of refined copper was 1,127,533 lbs. in 1900.

VANCOUVER & BOUNDARY CREEK DEVELOPMENT & MINING CO. BRITISH COLUMBIA.

Mine office: Penticton, Yale & Cariboo district, B. C. C. Vacher, manager. Ores carry gold, silver and copper. Has steam power.

VEILED PROPHET COPPER CO., LTD. ARIZONA.

Office: 27 William St., New York. Mine office: Clifton, Graham Co., Ariz. Capitalization $500,000, shares $1 par. Ben M. Crawford, general manager. Lands, 5 claims, area 100 acres, near the Shannon, Standard and New England & Clifton mines, with high-grade surface ores, developed by open-cuts and short tunnels, giving assays of 16% to 20% copper from high-grade ores, and concentrating ores giving assays of 4% to 8% copper, with an average of about 6 oz. silver and $4 gold per ton.

VELARDENA MINING & SMELTING CO. **MEXICO.**

Office: Omaha, Neb. Mine office: Velardeña, Durango, Mex. Controlled by Guggenheim Exploration Co. John R. Bapty, general manager; M. Dahlgren, mine superintendent; Wm. Daly, smelter superintendent. Smelter, of 250 tons daily capacity, is at Velardeña, connected with mines by a railroad of 24 kilometres. A 400-ton concentrator is being erected at a cost of $250,000, Mexican. Mine is developing well, and is already a considérable producer of copper, silver and lead. Property is regarded as of exceptional promise.

VELVET (ROSSLAND) MINE, LTD. **BRITISH COLUMBIA.**

Offices: 23, Leadenhall St., London, E. C., Eng. Mine office: Rossland, B. C. A. Davidson, chairman; W. A. Stearns, secretary; S. Severin Sörenson, general manager. Capital, £200,000. Lands, 45 acres, on Sophie Mountain, Rossland, averaging about $14 per ton in gold, copper and silver. Has steam power and employs about 50 men.

VENICE COPPER CO, **MEXICO.**

Office: Venice, Ills. Mine office: Soyopa, Sonora, Mex. Benj. T. Scott, manager. Ores carry gold, silver and copper. Is opened by a 1,200′ tunnel. Has steam power and 50-ton smelter. Said to be negotiating for sale of mines and smelter to Calumet & Yaqui River Copper Co.

VENTURA-COLORADO COPPER MINING & SMELTING CO.

Incorporated, 1903, under laws of Colorado, by D. H. De Arman, et al.

VENTURE HILL MINING CO. **ARIZONA.**

Office and mines: Jerome, Yavapai Co., Ariz. Employs 6 men. Organized 1900, under laws of Arizona, with capitalization $3,000,000, shares $1 par. Thos. E. Campbell, president and general manager; Geo. H. Avery, vice-president and superintendent; Chas. F. Avery, secretary; Frank E. Jordan, treasurer. Lands, 6 patented claims, area 110 acres, in the Verde district, showing 2 fissure veins, estimated by company to have average width of 90′ and average values of 4.7% copper, 6.5 oz. silver and $4 gold per ton, from oxide and sulphide ores, developed by shafts of 65′ and 87′, and tunnels of 205′ and 457′.

VERDE CONSOLIDATED COPPER CO. **ARIZONA.**

Office: Prescott, Ariz. Mine office: Jerome, Yavapai Co., Ariz. Jacob Marks, president; T. E. Campbell, secretary and treasurer. Capitalization $1,500,000, shares $1 par.

VERDE MINING & MILLING CO. **WYOMING.**

Office: 523 Bee Bldg., Omaha, Neb. Mine office: Battle, Carbon Co., Wyo. Organized, 1900, under laws of Wyoming, with capitalization $1,500,000, shares $1 par. J. E. Thatcher, secretary and treasurer; C. M. Jacques, president; J. F. Hinton, general manager. Lands, 4 claims, area 80 acres, showing a 35′ fissure vein giving assays of 5% to 21% copper, 6 oz. silver and $5 gold per ton, from malachite, bornite and chalcopyrite. Has 3 shallow shafts and steam power.

VERDE APEX COPPER MINING CO. **ARIZONA.**

Mine office: Jerome, Yavapai Co., Ariz. Letters returned unclaimed from former main office, 66 Broadway, New York. Organized 1900, with capitalization $3,000,000, shares $1 par. Chas. B. Lutz, Bloomsburg, Pa., president; F. E. Jordan, agent. Lands, 6 claims, area about 90 acres, in Mescal Gulch, about a mile south of Jerome, slightly opened by shaft and tunnel. Developments are hampered by lack of funds.

VERDE CHIEF MINING CO. **ARIZONA.**

Office: 1506-20 Broad St., New York. Mine office: Jerome, Yavapai Co., Ariz. Organized under laws of Arizona, with capitalization $3,000,000, shares $1 par. Dr. Clarendon A. Foster, president; Henry T. Rogers, secretary; C. H. Acker, superintendent. Lands, 10 claims, 7 miles south of Jerome, with about 1,700′ of underground openings, showing auriferous and argentiferous copper ore. Idle.

VERDE GRANDE COPPER CO.

Letter returned unclaimed from former office, in Chicago.

VERDE GRANDE COPPER CO. **MEXICO.**

Office: 308 North Sixth St., St. Louis, Mo. Mine office: Apartado 98, Hermosillo, Sonora Mex. Employs about 120 men. Organized 1901, under laws of Arizona, with capitalization $2,500,000, shares $5 par. G. C. Campbell, president; Geo. H. Martin, secretary; Jairus D. Fresh, general manager; Jas. Penman, superintendent. Lands, 500 acres, in the Ures district, about 40 miles northwest of Hermosillo, lying about 2,000′ above sea-level, partly timbered with ironwood, cottonwood and mesquite. Water is scarce on surface, but can be developed by wells. The main tract of 460 acres includes the Verde Grande, La Verde, La Cobriza and San Luis groups, showing veins of 10′ to 100′ width, largest veins being low in grade. The Verde Grande group shows veins and deposits in limestone, in a secondary eruptive formation, ores assaying about 6% copper, 6 oz. silver and $1 gold per ton. La Verde and La Cobriza groups show a contact vein, between granite and quartzite, having a gangue of talcose limestone interstratified with granite and quartz, this vein being 30′ to 60′ wide and traceable about 7,000′, giving assays of 5.5% to 16% copper, with high gold and silver values. Mines are developed by 16 different shafts and tunnels, with about 4,000′ of underground openings, estimated by company to show 200,000 tons of ore. A smelter, 1½ miles from the principal mine openings, with a 100-ton Allis-Chalmers water-jacket blast furnace, is nearly completed. The company has made many exaggerated statements regarding its properties, in placing stock, but the showing of ore secured is encouraging and with proper management a successful mine may be made.

VERDE KING COPPER CO. **ARIZONA.**

Office: 401 Henne Bldg., Los Angeles, Cal. Mine office: Jerome, Yavapai Co., Ariz. Organized 1900, under laws of Arizona, with capitalization $1,000,000, shares $1 par. Chas. J. George, president; Baron W. Riley, secretary; Joseph Gray, superintendent. Lands, 17 adjoining claims, with about 3,000′ of openings. Has auriferous and argentiferous copper ores, giving assays of 11.5% to 24.5% copper.

VERDE QUEEN COPPER CO. OF ARIZONA. ARIZONA.

Letters returned unclaimed from former offices, 39 Cortlandt St., New York, and Marietta, Ohio. Lands, 28 claims, with a 40-ton smelter, near Jerome, Yavapai county, Arizona.

FRANCISCO VERGARA I. CHILE.

Office and mine: Petorca, Aconcagua, Chile. Owns and operates the Mauro mine, opened 1860, making about 100 long tons of copper yearly, shipped as matte.

VERMONT & ARIZONA COPPER CO. ARIZONA.

Office: 150 College St., Burlington, Vt. Mine office: Tombstone, Cochise Co., Ariz. Idle. Organized 1899, under laws of Arizona, with capitalization $1,500,000, shares $5 par. Hon. Hamilton S. Peck, president; J. H. McLoud, secretary and treasurer; J. A. Collier, superintendent. Lands, 11 claims, area 230 acres, in the Turquoise district, on the western slope of the Dragoon mountains, showing 2 gold and silver veins and several copper veins, latter giving assays of 23% to 43% from carbonate ores and opened by a 230′ main shaft, with 1,500′ of underground openings, with about 1,000′ of development on 10 adjoining claims.

VERMONT & BOSTON MINING CO. VERMONT.

Letter returned unclaimed from Berkshire, Franklin Co., Vt.

VICTOR CONSOLIDATED MINING CO. UTAH.

Mine office: Eureka, Juab Co., Utah. Vivian McCune, general manager; J. Treloar, superintendent. Mines are the Victor, Boss Tweed and others, producing gold, silver and copper. Has steam power and employs 50 men.

VICTOR BONANZA MINING CO. CALIFORNIA.

Letter returned unclaimed from Dos Palos, Merced Co., Cal.

VICTORIA COPPER CO. AUSTRALIA.

Reorganized repeatedly. Now the African & Australian Co., Ltd.

VICTORIA COPPER MINING CO. MICHIGAN.

Office: 539-53 State St., Boston, Mass. Mine office: Victoria, Ontonagon Co., Mich. Employs 125 men. Organized 1899, under laws of Michigan, with capitalization $2,500,000, shares $25 par; $10 paid in. Calvin Austin, president; Chas. D. Hanchette, vice-president; Jas. P. Graves, secretary and treasurer; preceding officers, Wm. F. Humphreys and Fred H. Williams, directors; Thos. Hooper, superintendent; Geo. Hooper, mining captain.

Official returns to the state of Michigan, as of date Jan. 1, 1903, disclose the following figures:

Amount cash paid in on capital stock	$964,830.00
Entire amount invested in real estate	372,722.90

The company ended 1903 with available resources of $199,952, including an assessment of $1, levied payable in January, 1904.

Lands, 2,249 acres, in Sections 19, 20, 29, 30 and 31, Town 50 North, Range 39 West, and Sections 24, 25 and 36, T. 50 N. R. 40 W., in Ontonagon county, Michigan, giving a tract with an extreme width of two miles east stantially built that it cannot be torn out by a log-jam. The outlet is a 44″ steel pipe, leading from the bottom of the dam to the power canal

The canal diverting water from the dam is nearly 6,000′ in length, running for about 2,000′ through sandstone and 4,000′ in alluvium. The canal is 50′ wide at the top, 20′ wide at the bottom and 12′ deep. The outlet of the canal has 6 gates, in two sets, separated by a heavy concrete abutment. The gateways are made of 20″ "I" beams set vertically 6′ apart, with 6 gates of heavy oak planking, worked vertically by rack and pinion actuated by water power. The canal leads to a 20x20′ shaft, now sinking, which is to be nearly 300′ in depth, and will connect at the bottom with a tail-race to the lower river. Instead of using turbines the water will be made to compress air at the bottom of the shaft, the power installation becoming a hydraulic air compression plant.

The millsite is about 6,000′ from the mine, with a right-of-way connecting, this providing for a gravity line with 9% grade. The mill will be built for two stamps, probably starting with a single head, and will use compressed air throughout. Nearest railroad is the Chicago, Milwaukee & St. Paul, at Rockland, 3 miles distant, but connection may also be given by the Holt logging railroad. The company's lands are well timbered and contain an inexhaustable supply of good building stone.

The management of the Victoria has been highly able and prudent, since the organization of the company. No Lake Superior mine has expended its funds more carefully, or has secured better values for its outlay. The Victoria is not a rich mine and is not so claimed by its owners, but it has been extensively developed and will begin production with ample stoping ground to feed one head. The property will also enjoy an exceptional advantage in its cheap power, and should be able to show perhaps the lowest mining costs, and certainly the cheapest milling costs, of any Lake Superior copper mine, when production is begun, which will probably be late in 1905.

VICTORIA COPPER MINING CO. UTAH.

Mine office: Ashley, Unitah Co., Utah.

VICTORIA GOLD & COPPER MINING CO., LTD. BRITISH COLUMBIA.

Office: English Point, B. C. Capitalization $1,000,000, shares $1 par. Frank E. Starkey, president and general manager; Albert G. Starkey, secretary and treasurer. Lands, 200 acres, west of Rossland.

VICTORIA BOULDER MINING CO. COLORADO.

Mine office: Salina, Boulder Co., Colo. H. B. McClure, manager. Ores carry gold, silver and copper. Has steam power and employs about 25 men.

FELIX VICUNA. CHILE.

Office and mines: Barco, Higuera, Serena, Chile. Operates the Higuera mine, opened in 1855, producing 800 to 1,000 tons of refined copper yearly, and also owns the Solitaria mine, 130′ deep, opened in 1893; the Panchita mine, 350′ deep, opened in 1850, and the San Ramon mine, 270′ deep and opened in 1851. Last three properties idle at last accounts.

VIELLA COPPER CO., LTD. SPAIN.

Offices: Broad Street Ave., London, E. C., Eng. Mine office: Viella, Huesca, Spain. H. Ellis, chairman; Don José E. De Olano, local director; H. Stone, secretary; James McTare, consulting engineer; S. Trythall, mine manager. Capital, nominal, £100,000; issued, £85,000. Lands, 340 acres, 9 miles from Viella, held on perpetual lease from the government, at an annual rental of about £30.

VIGSNES KOBBERVAERKS AKTIEBOLAG. NORWAY.

Office: Talbodgaden, 8B, Christiania, Norway. Mines include the Vigsnes and Stavanger, sometimes known as the Meraker mines, in the Rōros district, south of Trondhjem, Norway. Deepest shaft is 2,389′. Were long the principal producers of Norway, and made 960 long tons of refined copper in 1895, but since idle.

VILLAGE BELLE GOLD & COPPER CO. COLORADO.

Mine office: North Park, Routt Co., Colo.

VINDICATOR GOLD & COPPER MINING CO. UTAH.

Office: care of Sam T. Myers, secretary, Ogden, Utah. Geo. F. Busch, president. Capitalization $1,000,000, shares $1 par. Lands, undergoing exploration, are near Unitah, Weber county, Utah.

VIOLA GOLD & COPPER MINING CO. WASHINGTON.

Former fiscal agents, Archibald McNicoll & Co., removed from 276 West Broadway, New York, and left no address behind. Such cases are numerous, the shareholders being "left behind" also.

MINA VIRGINIA. CHILE.

Mine office: Chañaral, Atacama, Chile. Manuel Hidalgo, owner; Fernando Hernandez, manager. Employs about 75 men.

VIRGINIA CONSOLIDATED COPPER CO. VIRGINIA.

Office: 518 Walnut St., McKeesport, Pa. Mine office: Luray, Page Co., Va. Employs 10 men. Organized Oct. 15, 1901, under laws of New Jersey, with capitalization $1,000,000, shares $1 par. W. Harry Hamilton, president; Harry Dunshee, vice-president; J. M. Mackintosh, secretary; Thos. A. Dunshee, general manager. Lands, 300 acres, owned in fee, in Page county, showing 3 parallel veins, one said to be a fissure in trap and two occurring as contacts between trap and quartzite. One vein, opened by a shaft of 320′, with 950′ of underground openings, averages 12′ width and gives average assays of about 6% copper, 4 oz. silver and $1.80 gold per ton, from carbonate ores, with occasional occurrence of native copper. Has a gasoline hoist and 3-drill air compressor.

VIRGINIA COPPER CO., LTD. VIRGINIA.

Offices: 99 Cedar St., New York, and 95, Gresham St., London, E. C., Eng. Mine office: Highhill, Halifax Co., Va. Registered August 31, 1900, under laws of United Kingdom, with capitalization £300,000, shares £1 par. Com, modore P. Vedder, president; F. M. Davis, vice-president; Jas. B. Van Woert-secretary; Richard Lamb, general manager; Evan Davies, superintendent. Lands, 1617 acres, including the High Hill mine, in the Virgilina district, developed by 8 shafts of 140′ to 300′ depth, with about one mile of underground openings. Property shows 2 veins, giving assays up to 5.9% copper, 2 oz. silver and 80c. gold per ton, from highly silicious ores. Has a 350-h. p.

steam plant and concentrator, reducing ores 11 into 1, concentrates being shipped to New York and Norfolk, Virginia, for smelting. Was working on a small scale at last accounts.

VIRGINIA COPPER MINING & SMELTING CO. **ARIZONA.**

Mine office: Casa Grande, Pinal Co., Ariz. W. P. Guthridge, superintendent. Operates the Reward mine, producing argentiferous copper ore. Has steam power, 30-ton water jacket furnace and contemplates erection of a larger reduction plant. Employs 30 men.

VIRGINIA BELLE GOLD & COPPER MINING CO. **ARIZONA.**

Office: 13 South 7th St., Minneapolis, Minn. Mine office: Vails, Pima Co., Ariz. Employs 9 men. Organized January, 1902, under laws of Arizona, with capitalization $1,500,000, shares $1 par; issued, $1,000,000. John F. Wallis, president; C. F. Potter, Jr., secretary; Jas. H. Bennett, general manager. Lands, 8 claims, area 160 acres, also a 40-acre millsite, in the Rincon district, having two contact veins between limestone and granite-porphyry, opened by 4 shafts, deepest 161′, showing ores assaying 5% to 30% copper and $5 to $25 gold per ton.

VITA RICA SILVER & COPPER MINING CO. **MEXICO.**

Mine office: Charcas, S. L. P., Mex. C. H. Hoffman, manager. Has steam power and employs about 20 men.

VIVANDIERE COPPER CO. **COLORADO.**

Mine office: Turret, Chaffee Co., Colo. J. J. New, superintendent. Is installing a 50-ton concentrator, to handle low-grade ores carrying copper, silver and gold. Has steam power and employs 25 men.

VOLCANIC COPPER MINING & SMELTING CO. **CALIFORNIA.**

Dead. Former office, 256 So. Broadway, Los Angeles, Cal.

VOLCANIC MINING, SMELTING & DEVELOPMENT CO. **BRITISH COLUMBIA.**

Office: 207 Savings Bank Bldg., Marquette, Mich. Mine office: Grand Forks, B. C. Employs 6 men. Chas. Schaeffer, president; Geo. W. Hibbard, vice-president; Dr. F. McD. Harkin, secretary; Alex. P. Meads, superintendent. Organized Nov. 25, 1903, under laws of Michigan, with capitalization $50,000, shares $25 par, in 1,000 shares preferred and 1,000 shares common stock; issued, $25,000, with $7.50 per share paid in. Lands, 102 acres, in the Yale district, showing a monstrous vein, estimated to have 600′ width, carrying chalcopyrite in pyrrhotite, developed by an 800′ tunnel. Property is immense, though low in grade, and is to be developed by extension of tunnel, supplemented by diamond drill borings, latter now in progress.

VON GERNET COPPER, LTD.

Offices: St. George's House, Eastcheap, London, E. C., Eng. Maj. F. I. Richarde-Seaver, F. R. S., chairman; D. Mountier, secretary. Registered July 4, 1901, to acquire patents and concessions for extraction and treatment of ores of copper, gold and other metals. Capital, nominal, £11,000, in 10,000 preference shares of £1 and 10,000 ordinary shares of 2s.; issued, £2,197.

J. D. VORIS COPPER MINING CO. **COLORADO.**

Mine office: Hillside, Fremont Co., Colo.

VUELTA FALSA MINES. **SPAIN.**

Office: care of Miguel Yglesias, 2, Tokenhouse Bldgs., London, E. C., Eng. Mine office: Paimago, Huelva, Spain. Group includes the Fronteriza and other mines, near the Chanza river, which separates Spain and Portugal. Property shows a vein of about 20′ width, giving good assay values in copper, with about 46% sulphur. Was under investigation by Messrs. Aznar y Ca., of Bilbao, Spain, at last accounts.

VULCAN CONSOLIDATED COPPER CO. **NEVADA.**

Office: 35 Nassau St., New York. Mine office: Siegelton, Esmerelda Co., Nev. Organized 1899, as the Vulcan Copper Mining & Smelting Co., and reorganized 1901, with present title, under laws of West Virginia, with capitalization $5,000,000, shares $10 par; issued, $3,000,000. Chas. F. Champion, president and general manager; Joseph Siegel, first vice-president; Ambrose I. Harrison, secretary and treasurer; Newton A. Duncan, superintendent. Lands, 49 claims, area 980 acres, also 3 millsites, in the Sodaville or Santa Fe district, developed by about 7,000′ of shafts and tunnels, and claimed to show about 60,000 tons of ore assaying 2.7% to 4% copper, with gold and silver values of 75c. to $1 per ton. Has a small smelter, which is idle, and has been experimenting with a leaching process. Company peddled its stock industriously, but has signally failed to make good any of the florid promises of its promoters, and does not pay its bills.

VULCAN COPPER CO. **OREGON.**

Office: San Francisco, Cal. Mine office: Takilma, Josephine Co., Ore. Bought the property of the Mountain View Copper Co. for $24,000. Equipment includes a 30-ton Vulcan smelter, never blown in. Mine shows a promising vein of bornite. Further development awaits the construction of a railroad into the Waldo district.

VULCAN COPPER MINING CO. **WYOMING.**

Office: Wassau, Wis. Mine office: Encampment, Carbon Co., Wyo. Organized 1898, with capitalization $1,000,000, shares $1 par. W. H. Monroe, president; W. D. Kolloch, secretary; F. J. Lordier, superintendent. Lands, 120 acres, in the Encampment and Battle Lake districts. Has 3 shafts deepest, about 100′, with a 15′ sulphide ore vein. Satisfactory title has been secured to lands formerly in litigation. Idle at last accounts.

WABASH MINING CO. **CALIFORNIA.**

Office: Los Angeles, Cal. Mine office: Letcher, Fresno Co., Cal. Dr. J. H. Bryant, president. Lands, 16 claims, adjoining the Copper King, with two shallow shafts, and tunnels of 300′ and 400′. Has steam plant and air compressor.

WABASH MINING CO. **UTAH.**

Mine office: Park City, Summit Co., Utah. G. M. Gillett, superintendent. Ores carry gold, silver, lead and copper. Has steam power and employs about 20 men.

WAGNER-GREEN MINING & MILLING CO. **COLORADO.**

Letter returned unclaimed from Pearl, Larimer Co., Colo.

WAHNITA COPPER MINING CO. **MICHIGAN.**

Fraudulent. Name changed to Erie Cons. Mining & Reduction Co.

WAIDANI MINE. **JAPAN.**

Mine office: Kamine-mura, Taka-gori, Bizen, Japan. Ore is argentiferous chalcopyrite, associated with sphalerite and galena, in two very thin veins. A small producer only.

WALDO COPPER MINES CO. **OREGON.**

See Waldo Smelting & Mining Co.

WALDO SMELTING & MINING CO. **OREGON.**

Office: P. O. Box 1487, Colorado Springs, Colo. Mine office: Takilma, Josephine Co., Ore. Employs 10 men. Organized Dec. 3, 1901, under laws of Colorado, with capitalization $3,000,000, shares $100 par. Chas. L. Tutt, president and manager; Spencer Penrose, secretary and treasurer; J. A. Hull, assistant secretary and treasurer; Col. T. Waln-Morgan Draper, superintendent. Lands, 20 patented claims, area 400 acres, with mill and smelter sites and 650 acres of placer lands, in the Waldo district, showing 5 fissure veins, said to average about 10′ width and giving estimated average values of 12% copper and $3 gold per ton, from sulphide ores. Development is by a shaft and two tunnels. The Copper King shaft, about 200′ deep, has an 80′ crosscut-drift showing a good ore body. The 700′ Lyttle tunnel and the 400′ No. 2 tunnel, on the same claim, show fine bodies of ore. The 310′ Cowboy tunnel connects with the incline shaft 160′ below surface, and is to be extended to intersect known ore bodies. There has also been considerable development secured and a large ore body opened on another property, title to which is in litigation. Property is about 40 miles from the Southern Pacific railroad, but a line has been surveyed through the district. Various development work is planned for 1904. Officers of the company are men of the highest standing, with long and successful experience in mining, and the property is regarded as promising.

WALES COPPER MINING CO. **ALASKA.**

Office: 310 Meigs Bldg., Bridgeport, Conn. Organized under laws of Washington, with capitalization $1,500,000, shares $1 par. Dr. Johnson Armstrong, president; Alex. Veith, secretary. Lands, 7 claims, on Mt. Andrews, Prince of Wales Island, Alaska, developed by about 500′ of shafts, tunnels and open cuts, showing sulphide ores giving average assay values of 12.5% copper, 85c. silver and $4.10 gold per ton. Company modestly advertises that it has the richest copper mine on earth, but fails to produce evidence to substantiate this claim, notwithstanding which the property is considered promising, and, with adequate capital and proper development and management, might make a mine.

WALL STREET MINE. **NEVADA.**

Mine office: Luning, Esmerelda Co., Nev. A. S. Lawrie, supt.

WALLAROO & MOONTA MINING & SMELTING CO., LTD. **SOUTH AUSTRALIA.**

Offices: Grenfell St., Adelaide, South Australia. Mine office: Moonta, Yorke Peninsula, South Australia. Employs about 1,800 men. D. Davidson, secretary; H. Lipson, general manager. The Moonta and Wallaroo mines, both on the Yorke Peninsula, about 10 miles apart, were amalgamated in 1890. The Wallaroo mine, discovered 1860, has an area of about 2,000 acres, including the Kurilla, with about 30 shafts, deepest 1,620′, with some 30 miles of underground openings. Country rocks are schists, showing 6 veins, the main vein standing nearly vertical with a strike of 10° to 20° south of east. The gossan gave a little atacamite and carbonate ores at surface, followed by cuprite and melaconite, but the oxidized ore bodies were practically exhausted many years ago. At depth the ore is mainly chalcopyrite, running 3% to 10% as mined, with a gangue of iron pyrites, calcspar and schistose country rock. Veins vary from a few inches to 40′ in width, main vein averaging about 14′ width.

The Moonta mine, discovered 1861, has an area of 2,673 acres, held as leasehold from the crown. Property shows 27 veins, running 6″ to 20′ in width, with 5 main veins having numerous stringers and laterals. Country rock is felsite-porphyry and ore below the oxidized zone is chiefly chalcopyrite, with a little bornite, having a quartz gangue, there being occasional occurrences of native copper. Development is by 21 trial shafts and 56 working shafts, many of the latter being abandoned. Deepest shaft, known as the Taylor's, is 2,340′ in depth, and the mine has 4 other shafts of 1,500′ or more. Shafts are mostly vertical for a short distance, then incline on the dip of the lode. The mine has upwards of 40 miles of underground openings. The Moonta ores are roasted, then leached with sea-water and dilute sulphuric acid, cement copper being precipitated in tanks. The old tailings from the Moonta, amounting to about 1,000,000 tons, are now being leached.

Annual production of the Wallaroo & Moonta is about 15,000,000 lbs. of refined copper, the cost of the Moonta copper being about 10.5c. per lb., with somewhat lower costs at the Wallaroo.

WALTHAM MINES CO., LTD. **COLORADO.**

Offices: 155, Fenchurch St., London, E. C., Eng. Mine office: Russell Gulch, Gilpin Co., Colo. J. H. Gower, superintendent. Ores carry gold, silver and copper. Employs about 20 men.

WANDILTA COPPER MINES, LTD. **AUSTRALIA.**

Offices: 30, Moorgate St., London, E. C., Eng. Mine office: Kadina, Yorke Peninsula, So. Australia. A. S. Caine, chairman; J. A. Russell, secretary. Lands, 140 acres, including the Wandilta mine, near Wallaroo. Main shaft, 240′. Vein is 2′ to 3′ wide, with a limited amount of development.

WAPITI MINING CO. **COLORADO.**

Office: 932 Equitable Bldg., Denver Colo. Mine office: Wapiti, Summit Co., Colo. A. J. White, superintendent. Ores carry gold, silver, lead and copper. Has steam and water power, with concentrator and 5′ Huntington mill.

WAR EAGLE CONSOLIDATED MINING & DEVELOPMENT CO., LTD. **BRITISH COLUMBIA.**

Office: Toronto, Ont. Mine office: Rossland, B. C. Authorized capitalization, $2,000,000; issued, $1,750,000; shares $1 par. Has been a considerable dividend payer. Geo. Gooderham, president; E. J. Kingstone, secretary; E. B. Kirby, general manager. Lands include the War Eagle, Richmond, Crown Point and other mines, carrying ores of copper, gold and silver. Ores treated in 1901 averaged about 2.1% copper, $16 gold and 1 oz. silver per ton, producing about 750,000 lbs. of refined copper that year. Plans installing a 50-ton Elmore oil concentrator plant in 1904.

WARRA WARRA MINE. AUSTRALIA.

Office: care of F. Stevens, Grenfell St., Adelaide, South Australia. Ores are chalcopyrite, chalcocite, cuprite, malachite and native copper, with quartz gangue and clay gouge, in country rocks of clayslates, sandstone and quartzite in alternating strata. Has two shallow vertical shafts, in ore bodies of fair size.

WARREN DEVELOPMENT CO. ARIZONA.

Office: care of C. D. Hanchette, treasurer, Hancock, Mich. John Funkey, president; J. A. Fuller, secretary. Organized 1903, under laws of Michigan, with capitalization $100,000, shares $10 par; issued, $16,000. Lands, 12 claims, area 200 acres, adjoining the property of the Higgins Development Co., at Bisbee, Cochise county, Arizona.

WARRIOR MINING CO. COLORADO.

Office: care of W. F. Hess & Co., 32 Continental Bank Bldg., St. Louis, Mo. Lands, 26 claims and 2 millsites, in Castilla county, Colorado, claimed to show ores assaying up to 12% copper, 20 oz. silver and 2 oz. gold per ton.

WASATCH KING MINE. UTAH.

Mine office: Milford, Beaver Co., Utah. F. O. Meakin, superintendent. Is developing a 4′ copper vein with 20″ pay-streak, also a gold vein.

WASHINGTON MINE. CALIFORNIA.

In Sections 30, 31 and 32, T. 2 S., R. 15 E., Tuolumne Co., Cal. Owned by W. E. & G. A. Hensley. Was formerly a considerable producer. Vein formation is diabase and meta-diabase.

WASHINGTON CO-OPERATIVE MINING SYNDICATE. WASHINGTON.

Mine office: Fairfax, Wash. Lands, 2 claims, 17 miles by trail from Fairfax, showing a 25′ vein with 3′ pay-streak carrying disseminated chalcopyrite and assaying 5% to 33% copper, 5 oz. to 8 oz. silver and $2 gold per ton. Has water power and also owns a coal mine at Fairfax, where it is planned to build a small smelter.

WASHINGTON COPPER & MILLING CO. WASHINGTON.

A swindle, promoted by the notorious L. E. Pike & Co., who are still peddling worthless stock to the credulous public. These swindlers advertised the mine to be "the richest copper property in the United States, with even more flattering prospects than the Calumet & Hecla or United Verde." The "mine" consisted of a 50′ shaft, bottomed in gravel. Yet Pike & Co are still permitted to use the mails to defraud unfortunate investors of small means by similar humbugs.

WASHINGTON COPPER MINING CO. **MICHIGAN.**

Office: 60 State St., Boston, Mass. Organized under laws of Michigan, with capitalization $2,500,000, shares $25 par; issued, $1,500,000. Annual meeting, fourth Tuesday in March. H. F. Fay, president; Jas. Chynoweth, superintendent; preceding officers, John C. Watson, Stephen R. Dow and Chas. E. Adams, directors; Geo. G. Endicott, secretary and treasurer. Lands, 1,050 acres, on the western shore of Mosquito Lake, Keweenaw county, Michigan. Exploratory work was discontinued in spring of 1901, present policy of company being to await developments on neighboring lands. Had $3,859.22 cash on hand, Jan. 1, 1904.

WASHINGTON COPPER MINING & SMELTING CO.

Office: 5 Tremont St., Boston, Mass.

WASHINGTON MINERAL MINING & SMELTING CO.

Office: 510 Bernice Blk., Tacoma, Wash.

WASHINGTON-SONORA GOLD & COPPER CO. **MEXICO.**

Office: care of A. Sandoval, treasurer, Nogales, Sonora, Mex. Organized 1902, under laws of Arizona, with capitalization $2,500,000, shares $5 par. A. L. Lewis, president; Percy Sharpe, secretary and general manager; A. H. Hoover, superintendent. Lands, 4 pertenencias, area 10 acres, in the Magdalena district of Sonora, Mexico, showing fissure veins and lenses in limestone carrying a little native copper, oxide and carbonate ores, giving estimated values of 18% copper, 12 oz. silver and $4 gold per ton. Has slight development by shafts and tunnels.

WASHOE COPPER CO. **MONTANA.**

Mine office: Butte, Silver Bow Co., Mont. Employs about 300 men. Wm. Skyrme, superintendent. Capitalization $20,000,000, entire stock issue being held by the Amalgamated Copper Co. Lands include the Moonlight, Chambers, Clear Grit, Washoe, Pacific, Oden and Gold Hill claims. The Moonlight is the principal producer, having a 3-compartment shaft about 1,400′ deep, connected underground with the Blue Jay, Never Sweat, Anaconda and Pacific, with a 20x48″ Dickson hoist and two Ingersoll-Sergeant air compressors of 50 drills aggregate capacity. The Clear Grit is in litigation with the Heinze interests. The Chambers has a 200′ shaft only, and the other claims are but partially developed. Ores give about the same average returns as those of the Anaconda. The smelter of this company is described in the article on the Anaconda mine. Production for the year ending June 1, 1903, was 106,588 tons of ore, giving a gross yield of $10.45 per ton. Mining costs were $3.75 and smelter costs $3.08 per ton. Production of refined copper was about 9,000,000 lbs. for year ending June 1, 1903, and about 8,000,000 lbs. for the calendar year 1903.

WASHOUGAL GOLD & COPPER MINING CO. **WASHINGTON.**

Office: 5312 Maple Ave., St. Louis, Mo. Mine office: Washougal, Clarke Co., Wash. F. A. Mabee, president; James B. Jordan, secretary; A. D. Wright, general manager; Ora Wright, superintendent. Organized 1892, under laws of South Dakota, with capitalization $1,000,000, shares $1 par. Lands, 260 acres, in the St. Helens district, with a 4′ fissure vein of sulphide ore in granite, developed by a 50′ shaft and 300′ tunnel, showing ores giving average assays of 3.5% copper and $15 gold per ton.

WAUKEGAN & WASHINGTON MINING & SMELTING CO. **WASHINGTON.**

Mine office: Bossburg, Stevens Co., Wash. James Moffatt, superintendent. Ores carry gold, silver and copper. Has steam power.

WAYEHUTTA MINE. **NORTH CAROLINA.**

Owned and operated by Carolina Copper Co.

WEILERTHALER BERGWERKE G. m. b. H. **GERMANY.**

Mine office: Markirch, Elsass, Germany.

C. WEISS Y CA. **PERU.**

Office and mine: Nuevo, Canete, Peru. Are small producers from ores carrying gold, silver and copper.

WELCOME GOLD MINING CO. **COLORADO.**

Mine office: Puzzler, Colo. Geo. L. Spence, superintendent. Operates the Silent Friend mine. Ores carry gold, silver and copper. Has steam power and employs a small force.

WELDON GOLD & COPPER CO. **ARIZONA.**

Office: Tucson, Ariz. Mine office: Quijotoa, Pima Co., Ariz. Employs 35 men. Organized Jan. 26, 1901, under laws of Arizona, with capitalization $2,500,000, shares $1 par. Peter White, president; Jos. A Green, vice-president; Ferris S. Fitch, secretary, treasurer and general manager; J. W. Giddings, superintendent; Fred Wall, mine superintendent; J. B. Tomlinson, engineer. Lands, 17 claims, area 340 acres, also a 10-acre millsite, in the Quijotoa district. Property shows sundry contact veins between granite and andesite-porphyry, of which 5, averaging 12′ to 35′ width, are under development, these showing oxide and carbonate ores at surface and chalcopyrite at depth, latter being auriferous and associated with sphalerite, galena and iron pyrites, with brecciated quartz gangue, giving average assays of 22% copper. Openings include 5 shafts, deepest 2,000′, and 7 tunnels, 5 of which are crosscuts, longest being an 1,800′ crosscut tunnel, with total underground openings of 2,905′. Has a 15-h. p. gasoline hoist and 4 power drills, with carpenter shop, machine shop, smithy, boarding-house, powder-house, assay office and store. Has a 75x100′ mill with 20 stamps, of 100 tons daily capacity. Property is 65 miles from the Southern Pacific railroad. Management plans sinking main shaft to depth of 500′ and opening levels every 50′. Officers of company are men of high standing and property is regarded as promising.

WELSH COPPER MINING SYNDICATE, LTD. **WALES.**

Offices: 9, Fenchurch Ave., London, E. C., Eng. J. Bell-Irving, chairman; J. Stevens, consulting engineer; W. H. Bartlett, secretary. Capital, £17,500. Lands, 933 acres, in Cardiganshire, Wales, including lead and copper mines and a reduction plant.

WENTWORTH MINE. **ARIZONA.**

Mine office: Payson, Gila Co., Ariz. J. G. Wentworth, superintendent.

WEST GROUP. **BRITISH COLUMBIA.**

Mine office: Yreka, Vancouver Island, B. C. Adjoins the Yreka mine.

WEST AUSTRALIAN MINING CO., LTD. **AUSTRALIA.**

Reorganized as African & Australian Co., Ltd.

WEST CHILLAGOE MINES. **AUSTRALIA.**

In the Chillagoe district of Queensland, Australia. Idle.

WEST FORK GOLD-COPPER MINING CO. **IDAHO.**

A rank fraud, promoted by the notorious L. E. Pike & Co.

WEST MOUNTAIN MINING COMPANY, OF ARIZONA. **UTAH.**

Office: Nashua, N. H. Capitalization $1,000,000, shares $1 par. Property is a group of well-located claims in Bingham Canyon, Salt Lake county, Utah, on which no work has been done for some years.

WEST ST. DAVID'S GOLD & COPPER MINES, LTD. **WALES.**

Offices: 156, Leadenhall St., London, E. C., Eng. Capital, £7.

WEST SIDE MINING CO. **WASHINGTON.**

Letters returned unclaimed from former office and officers.

WEST SLOPE COPPER MINING & MILLING CO. **UTAH.**

Letter returned unclaimed from former office, 627 Mining Exchange, Denver, Colo., and former mine office, La Sal, Grand Co., Utah. Gid. R. Propper, manager. Lands, 240 acres, slightly developed, showing a 4′ vein of auriferous and argentiferous copper ore.

WESTERN MINING CO. **COLORADO.**

Office: 71 Broadway, New York. Mine office: Lake City, Hinsdale Co., Colo. Saml. D. Nicholson, general manager; N. A. Nicholson, superintendent. Operates the Ute and Ulay mines, producing lead, copper, gold and silver. Has water, steam and electric power, with 200-ton concentrator. Employs about 100 men.

WESTERN MINING CO. **MONTANA.**

Office: Butte, Mont. Mine office: Apex, Beaverhead Co., Mont. Employs 64 men. Thos. F. Stephens, president, treasurer and general manager; T. Ellis, secretary; G. A. Heberlein, superintendent. Lands, one patented claim, known as the Indian Queen mine, also a 3-acre millsite, in the Utopia district. Country rocks are granite, dolomite and quartzite, showing 2 contact veins, between granite and limestone, averaging 8′ to 10′ width, developed by shafts of 150′ to 220′ and an 820′ tunnel, with 1,600′ of underground openings, estimated to show 50,000 tons of ore with 10,000 tons blocked out for stoping. Property shows nearly every commercial ore of copper except enargite, ores being mainly chalcocite and chalcopyrite, giving average returns of about 9% copper, 4.5 oz. silver and 40c. gold per ton. Was discovered 1867, and has been since worked intermittently by leasers. Has steam and gasoline power, with a smelter, connected by tramway with the shafts. Smelter has a 45-ton 36″ circular water-jacket blast furnace, making matte averaging 55% copper, 27 oz. silver and 0.13 oz. gold per ton, sent to the Butte & Boston smelter at Butte for refining. Nearest railroad is the Oregon Short Line, 7 miles distant. Average costs per ton are $4 for mining and $4.20 for smelting. Production for 1903 was about 700 short tons of refined copper. Management purposes sinking a new 3-compartment working shaft and driving a crosscut tunnel at depth of 250′, to permit cheaper ore extraction. Property is well managed and is giving good returns.

WESTERN SLOPE COPPER MINING & SMELTING CO. COLORADO.

Office: 38 Ames Bldg., Boston, Mass. Mine office: Grand Junction, Mesa Co., Colo. Organized under laws of Colorado, with capitalization $750,000, shares $1 par. Henry H. Marden, president; James V. Howard, secretary; W. C. McCurdy, general manager. Lands, 14 claims, area about 290 acres. Principal development is on the Nancy Hanks claim, with a 250′ shaft and 135′ of drifts, from which 17 cars of ore shipped to smelter gave returns of 11% to 18% copper. Company claims to have blocked out over 5,000 tons of ore, which is a remarkable achievement with only 135′ of drifts. Company is paying regular quarterly dividends of ½ of 1%, and selling stock.

WESTMORELAND COPPER CO. NEW BRUNSWICK.

Office: Dorchester, N. B. Said to have 7,000′ of underground openings, with concentrator, smelter and 80 precipitating tanks for copper leaching. Claimed to have expended $250,000 on mines and plant.

WEYMAN & YOUNG. ALASKA.

Office and mine: Coppermount, Alaska. E. E. Weyman, superintendent. Are developing auriferous and augentiferous copper ores, with water power and a small force.

WHALE MINE. NEW MEXICO.

Mine office: Tres Piedras, Taos Co., N. M. Wm. A. Royal, supt.

WHALEN COPPER MINING CO. NEVADA.

Lands, in vicinity of Alpha, Eureka county, Nevada, were attached for labor claims late in 1903. Chas. Lay, former manager, was missing at last accounts, and company seems hopelessly insolvent.

WHAT CHEER COPPER MINING CO. WYOMING.

Letter returned unclaimed from Riverside, Carbon Co., Wyo.

WHEAL KATE COPPER MINING CO. MICHIGAN.

Office: Houghton, Houghton Co., Mich. Organized November, 1902, under laws of Michigan, with capitalization $50,000. Lands, 240 acres, including the Wheal Kate mine. Is primarily a land and townsite company, no mining being done.

WHIMWELL COPPER MINES, LTD. AUSTRALIA.

Offices: 11, Ironmonger Lane, London, E. C., Eng. L. Downs, secretary. Capital, nominal, £150,000; issued, £100,007. Lands, 260 acres, in the Pilbarra Goldfields, Western Australia.

WHIPSAW COPPER CO. ARIZONA.

Office: 35 Wall St., New York. Mine office: Prescott, Yavapai Co., Ariz. W. T. Pickerell, agent.

WHITE BEAR MINE. BRITISH COLUMBIA.

Mine office: Rossland, B. C. Ores carry gold, silver and copper. Has steam power and employs 12 men.

WHITE EAGLE COPPER MINING CO. **TEXAS.**

Lands, at Burnett, Burnett County, Texas, were sold February, 1903, for $2,500, to pay debts.

WHITE HORSE MINING CO. **ARIZONA.**

Office: 20 Broad St., New York. Lands, 200 acres in Yavapai county, Arizona.

WHITE KNOB COPPER CO., LTD. **IDAHO.**

Office: 36 Wall St., New York. Mine office: Mackay, Custer Co., Idaho. Employs about 200 men. Organized originally, under laws of West Virginia, as the White Knob Mining Co., with capitalization $5,000,000; reorganized with present title, April 24, 1900, under laws of New Jersey, with capitalization $12,500,000, shares $100 par; again reorganized, January, 1903, under same charter and title, with capitalization $2,000,000, shares $10 par; issued, $1,500,000. Debentures, $500,000 of 6% 10-year sinking-fund gold bonds. Harry J. Luce, president; Wilbur K. Matthews, vice-president; Chas. G. Funk, secretary; Chas. B. Van Nostrand, treasurer; Percy L. Fearn, general manager; Arthur W. Jenks, superintendent.

Lands, 32 claims, 3 millsites, the 90-acre townsite of Mackay, sundry timber lands, water rights and right-of-way for an electric line, all in the Lost River Valley, with an area of about 2,100 acres. The main shaft is 700′ deep, connecting with the Albert tunnel, about 1,500′ long. Property is said to show a 23′ vein, carrying 3% to 9% copper and $1.75 to $3 gold and silver, with about 6 miles of underground openings, and considerable reserves of ore developed for stoping. The mine has a good machinery plant, including hoists, a 10-drill air-compressor and a 3-drill auxiliary compressor. Mine is reached by a 96-mile branch of the Oregon Short Line railway, running from Blackfoot to Houston. Mine is connected with smelter by a 10-mile electric railway having a maximum gradient of 6%, in a rise of 2,000′.

The smelter has three 200-ton furnaces, and was blown in September, 1902, but blown out after a month's run. One stack was blown in again October 5, 1903, and it was planned at that time to blow in the second stack a little later. The smelter is also treating custom ores of the Pocatello Gold & Copper Co., these making a desirable flux. Some trouble seems to have been had with the smelter, for reasons not apparent. In November, 1903, the smelter was said to be handling 300 to 500 tons of ore daily, making therefrom about 15,000 lbs. of copper, 800 oz. silver and 20 oz. gold, which would indicate a return of 1.5% to 2.5% copper only, with gold and silver values of $1.60 to $2.60 per ton. The policy of the company has been extremely vacillating, but apparently is more settled latterly. The success or failure of the property can only be determined by the test of actual production on a considerable scale for a considerable period.

WHITE PINE COPPER CO. **NEVADA.**

Office: care of M. L. Requa, 100 Front St., San Francisco, Cal. Mine office: Ely, White Pine Co., Nev. Capitalization $500,000. E. F. Gray, superintendent. Lands, in process of patenting, include the Ruth group, held under a $150,000 bond and lease, also the Lost Hope and Columbia of steel on stone foundations, with iron siding and roof, housing four 80-h. p. boilers. The Winona has 15 power drills, 5 drills being in use at the close of 1902. Other mine buildings are a 26x40′ warehouse, 20x40′ carpenter shop, 22x34′ smithy, 30x40′ store building, office building, two boarding houses, 16 frame dwellings and 9 log houses, the dwellings being built in a townsite platted by the company. The Winona also has a sawmill 30x70′ with a 42x66′ wing for boilers and a 16x46′ wing containing a shingle mill, the plant having a daily capacity of 20,000′ of sawed lumber. The main line of the Copper Range railroad passes near the mine and a spur has been built to No. 2 shaft. Production was begun, in an experimental way, with one head leased from the Atlantic mill, in December, 1902, and was continued during 1903, the monthly production showing many fluctuations, due to the lack of adequate productive facilities. At the close of the year about 160 tons of rock was being stamped daily, this returning about 26 lbs. of mineral per ton, although the copper is very fine and a considerable amount is lost in the tailings. Production in 1903 was 1,036,944 lbs. of refined copper, and will probably be about the same in 1904. The Winona is not yet an assured success, but the good stopes opened in the bottom level of No. 2 shaft, and the good ground passed through in sinking No. 3 shaft, have given much encouragement. The property has a thoroughly capable and experienced management, and, if it has the making of a mine, will certainly become a profitable producer in the hands of the present company.

WINONA GOLD-COPPER MINING & MILLING CO. WYOMING.

Office: 417 Kittredge Bldg., Denver, Colo. Organized under laws of Wyoming, with capitalization $5,000,000, shares $1 par. James R. Saville, president and treasurer; Henry F. Tower, secretary. Lands, 23 claims, area 475 acres, in the Sunlight district of Big Horn county, Wyoming, showing numerous veins of 8′ to 30′ width giving assays of 15% to 52% copper, 11 oz. to 15 oz. silver and about $1 gold, per ton. Property has a valuable water power and abundant timber.

WINONA-REX COPPER MINING CO. WYOMING.

Office: care of John Ludwig, president, Winona, Minn. Mine office: Encampment, Carbon Co., Wyo. Is developing on a small scale.

WIRRAPOWIE MINE. AUSTRALIA.

Mine office: Leigh's Creek, South Australia. W. H. Williams, superintendent. Has steam power and employs about 25 men.

WISCONSIN CLAIM. CALIFORNIA.

Mine office: Darwin, Inyo Co., Cal. Chas. Richardson, owner. Has a contact vein between limestone and granite, 2′ to 6′ wide, with shaft of about 150′, showing cuprite, malachite, and chalcopyrite.

WISCONSIN-WYOMING COPPER MINING CO. WYOMING.

Office: care of Wm. Ott, president, La Crosse, Wis. Mine office: Encampment, Carbon Co., Wyo. John M. Vrchota, secretary and general manager. Lands, two groups of claims, near the Hidden Treasure and Beulah.

WISSAHICKON GOLD-COPPER CO.

Organized 1902, in Delaware, with capitalization $1,000,000.

WOLVERINE COPPER MINING CO. **MICHIGAN.**

Office: 15 William St., New York. Mine office: Kearsarge, Houghton Co., Mich. Employs about 500 men. Organized 1890, under laws of Michigan, with capitalization $1,500,000, shares $25 par. Fiscal year ends June 30. Annual meeting, first Monday in August. American Loan & Trust Co., of Boston, transfer agent. John Stanton, president; Jos. E. Gay, vice-president; John R. Stanton, secretary and treasurer; preceding officers, J. Wheeler Hardley and Samuel L. Smith, directors; Fred Smith, superintendent; Willard J. Smith, assistant superintendent; Chas. L. Noetzel, clerk; Wm. Pollard, mining captain; B. S. Shearer, mill superintendent; F. Wm. Hartmann, engineer; A. B. Holtenhoff, master mechanic.

Official returns to the state of Michigan, as of date Jan. 1, 1903, disclose the following figures:

Amount cash paid in on capital stock	$780,000.00
Amount paid in by conveyance of property to company	550,000.00
Entire amount invested in real estate	720,665.23
Amount of personal estate	349,165.75
Amount of unsecured or floating debt	66,734.37
Production of refined copper, 1902	6,473,181 lbs.

The following table gives comparative figures for the three fiscal years ending June 30:

	1903.	1902.	1901.
Mineral production, pounds	11,330,370	6,232,800	5,853,400
Copper production, pounds	8,260,386	4,984,367	4,907,646
Gross proceeds	$1,030,755	658,602	821,671
Expenditures at mine	451,740	364,093	348,395
Smelting and miscellaneous	97,183	60,236	57,158
Construction account	38,014	264,678	27,708
Net mining profit	443,818	30,405	388,409
Interest received	2,505	6,731	7,125
Total net profit	446,323	—23,674	395,534
Dividends	270,000	240,000	240,000
Balance	+176,323	—263,674	+155,534
Rock hoisted, tons	299,922	213,650	223,9[illegible]
Rock stamped, tons	279,011	187,482	190[illegible]
Yield of rock treated per ton, lbs.	29.600	26.590	[illegible]
Cost per ton of rock hoisted	$ 1.510	1.700	[illegible]
Cost of stamping per ton	$ 1.620	.940	[illegible]
Cost per pound of refined copper at mine, cents	5.469	7.3[illegible]	[illegible]
Cost of smelting and miscellaneous, cents	1.176	1.2[illegible]	[illegible]
Total cost of refined copper, including construction, per pound, cents	7.105	13.8[illegible]	[illegible]

The mine was opened in 1882, by local capital, but wa[illegible] ized March 10, 1903, under laws of Arizona, with capitalization $500,000, shares $10 par, $5 paid in, and will call $2.50 per share early in 1904. Unissued, 17,182 shares. Annual meeting, second Wednesday in November. John Daniell, president; Paul P. Roehm, vice-president; W. R. Oates, secretary; W. Frank James, treasurer; preceding officers, W. H. Brophy, Fred Braastad, Thos. Maslin, Edw. Ulseth, B. F. Chynoweth and Arthur E. Delf, directors; R. Stewart Hunt, superintendent; W. H. Roberts, clerk. Company closed fiscal year, Oct. 1, 1903, with a cash balance of $62,460.80, without liabilities other than undue payments on bond and lease, under which the property is held.

Lands, 9 claims, area about 190 acres, claims being known as the Cairo, Memphis, Kentucky, Georgia, Louisiana, Chicago, Warren, George and Broken Promise. The Georgia claim lies about 600′ from the lands of the Calumet & Arizona, and about 3,000′ from the Irish Mag shaft of the Calumet & Arizona and the Spray and Holbrook shafts of the Copper Queen, three of the richest shafts in the Warren district. The Uncle Sam and White Tailed Deer mines of the Copper Queen are adjacent to the Wolverine & Arizona holdings, and leasers are taking rich ore from the White Tailed Deer about 800′ from the Wolverine shaft, the ore body of the White Tailed Deer dipping under the Wolverine & Arizona lands. A shaft, started April 21, 1903, on the Broken Promise claim, was 580′ deep at the close of the year. The shaft has 3 compartments, each 5x4′6″ and well timbered, cutting a limestone formation showing considerable iron. At a depth of 545′ the shaft cut a 16′ vein of low-grade ore, averaging about 4% lead, with 0.5% to 2% copper, which are not workable values, but are indicative of better ore at depth. The shaft has proven very wet at depth, and in addition to No. 7 and No. 9 Cameron sinking pumps is to install a 500-gallon Prescott station pump. A 108′ drift on the 500′ level is to be continued and shaft will continue sinking, in addition to which a diamond drill will be installed early in 1904. Surface equipment includes a 260-h. p. steam plant 2 single-drum hoists, a 6-drill air compressor, 25x50′ engine-house, office, bunk-house, boarding-house and a 10,000-gallon water tank, water being pumped from Naco, 8 miles distant. A large stock of timber and other supplies is carried. The location of the Wolverine & Arizona is such, and the indications of ore at depth are so strong, that the property can scarcely fail to make a valuable mine.

WOOD RIVER GOLD & COPPER CO.

Incorporated 1902, under laws of Delaware, with capitalization $1,000,000, by W. W. Watson, et al, of Scranton, Pa.

WRIGHT & LAWRENCE MINING CO. CALIFORNIA.

Office: 709 Stewart Bldg., Chicago, Ill. Eric Forsell, president; A. W. Linquist, general manager. Lands, 16 claims, area 320 acres, in Riverside county, California. A measly little stock-jobbing concern that is apparently rotten from center to circumference.

WRIGHT-RUSSELL COPPER MINING CO. WYOMING.

Mine office: Battle, Carbon Co., Wyo. W. J. Russell, manager. Has auriferous copper ore and employs a small force in development.

WYACCA MINE. **AUSTRALIA.**

Office: care of E. Pearce, Broken Hill Chambers, Adelaide, South Australia. Lands are in the Hundred of Basedow, 8 miles southwest of the Blinman mine, and about 260 miles north of Adelaide. Vein ranges 1" to 26" wide, carrying cuprite, melaconite and chalcopyrite, in gangue of calcspar and spathic iron.

WYANDOT COPPER CO. **MICHIGAN.**

Office: 24 Congress St., Boston, Mass. Mine office: Winona, Houghton Co., Mich. Organized 1899, under laws of Michigan, with capitalization $2,500,000, shares $25 par, $8 paid in. Old Colony Trust Co., of Boston, registrar. Annual meeting, first day of May. Henry Stackpole, president; Irving J. Sturgis, vice-president; Wm. O. Gay, secretary and treasurer; preceding officers, Jos. Dorr and Matthew Van Orden directors; Frank L. Van Orden, superintendent; Thos. Buzzo, mining captain.

Lands, 1,040 acres, adjoining the Winona mine, in Sections 16, 20 and 21, T. 52 N., R. 36 W., Houghton county, Michigan. Tract is crossed by the Copper Range railroad. Surface improvements include machine and blacksmith shops, warehouse, barns, and about 12 dwellings, with boilers, hoists, shop machinery and tools.

Exploratory work was begun February, 1899, and has been continued uninterruptedly. The overburden is very heavy, greatly impeding both shaft-sinking and diamond-drilling. Early work was performed in search of the Winona lode, while latter efforts have been made with a view to locating the southern extension of the Baltic amygdaloid. No. 1 shaft, 261' deep, is on an amygdaloid supposed to be the Winona, having a parallel underlying amygdaloid bed 60' distant, both being broken and of poor promise, though showing occasional patches of well-mineralized ground. Shaft No. 11, about a quarter-mile from No. 1, and 100' deep, shows a disturbed and unsatisfactory formation, with parallel amygdaloids 50' apart, these giving occasional bunches of good ground, but not payable at the depth gained. A 102' shaft has also been sunk on a lean cupriferous conglomerate underlying the Winona bed, and a 300' shaft sunk on an amygdaloid identified as the Elm River gave no promising ground.

All shafts having given such poor showings, mining work was stopped August, 1901, and boring begun with two diamond drills. These started at the Eastern Sandstone and worked backwards to the west, securing a nearly complete geological cross-section on the Wyandot tract, under great difficulties, owing to the heavy overburden of sand and boulders, this running 100' to 300' deep and averaging nearly 200' for the various holes. The drill-cores show that the formation is much disturbed across the entire tract. Drilling was stopped in 1902, and a new vertical shaft started on Section 28. This shaft penetrates a 95' overburden and is 250' deep, with crosscuts east and west, the east crosscut reaching the Eastern Sandstone at a distance of about 700' and cutting several mineralized amygdaloids, of which one, about 150' east of the shaft, is being drifted on about 150 men. Capitalization $5,000,000, shares $10 par. Wm. Sauntry, president; Geo. E. Green, secretary and treasurer; John M. Thurston, vice-president and general counsel; Chas. A. Kaiser, assistant general manager; W. E. Pomeroy, superintendent; Gen. Henry Ide Willey, engineer.

Lands, 6,032 acres, also 119,284 acres of timber and grazing lands, and water rights to 25 miles of the Yaqui river, mining lands being in the neighborhood of Suaqui de Batuc, Campo Santo Niño, Sonora, Mexico, in the Sierra Madre mountains, about 120 miles from Hermosillo. The property shows antiguas, supposed to have been worked by the Aztecs, as there are no records of their operation under Spanish dominion. The tract is well watered and well timbered, except in the more mountainous portions. In addition to gold, silver and copper, the tract carries iron ore, apparently of good grade, also promising coal beds.

A contact vein between granite and limestone is estimated by the company to be 80′ to 800′ in width, and several miles in length, with one exposure of one-quarter mile depth of the vein on the face of a mountain. The main ore body is crossed by a smaller vein, at nearly right angles. Oxidized ores are shown in the upper portions, with solid sulphides below, ores noted being cuprite, melaconite, malachite, azurite, chalcocite, bornite and chalcopyrite. Average assays of a large number of samples gave 14.92% copper, 6.6 oz. silver and 2.09 oz. gold per ton.

Development was begun in 1901, and is by 2 shafts and 8 tunnels, the ore standing well and requiring little timbering. Improvements include engine and boiler houses, office building and a store. Adjoining the mines are two villages, one inhabited by Mexican workmen and the other by Yaqui Indians. The property is about 75 miles from a railroad. Company plans installation of a 1,000-h.p. plant on the Yaqui river, and transmission of power to Campo Santo Niño, also plans the erection of a large concentrator on the Yaqui river, 3 miles from the mine and 4,000′ lower, transporting ores by gravity or aerial tram. Property shows low-grade ferruginous copper ores and limestone suitable for fluxing.

YAQUI SMELTING & REFINING CO. **NEW MEXICO.**

Office: Toledo, Ohio. Works office: San Antonio de la Huerta, Sonora, Mex. F. Davis, general manager; Victor A. Lucier, superintendent. Is building a smelter of 125 tons daily capacity, 80 miles east of Torres and 60 miles below Campo Santo Niño. Plant was furnished by the Allis-Chalmers Co., and is specially designed to reconcentrate, smelt and refine ores of silver, lead and copper. Equipment includes a two-story ore sampler, machine shop, electric light plant and ice plant. Is the first and only custom smelter in Sonora, and, being surrounded by a wonderfully rich mineral district, should earn good profits and greatly assist in the development of the resources of the state. Smelter is planned to be blown in early in 1904.

YAQUI RIVER LAND & DEVELOPMENT CO., LTD. **MEXICO.**

Offices: 4, Bank Bldgs., London, E. C., Eng. T. Morriss, secretary. Capital, £40,000. Lands, 87,000 acres, near Guaymas, Sonora, Mexico.

SOCIEDAD YAURICOCHA, LIMITADA. **PERU.**

Office and mine: Huaripampa, Yauyos, Peru. Is a small producer of argentiferous copper ores.

YAVAPAI COPPER CO. **ARIZONA.**

Office: 317 Main St., Springfield, Mass. Mine office: Prescott, Yavapai Co., Ariz. Geo. Nightingale, president; J. J. Hawkins, attorney.

NEGOCIACION MINERA DE CLEMENTE YBARRA. **MEXICO.**

Mine office: Promontorios, Sonora, Mexico. Don Clemente Ybarra, owner; Jesus Maria Quijada, manager. Employs 50 men. Property includes the Almada y Terito, Alvarado and Gloria, carrying gold, silver and copper ores, developed by shafts and tunnels.

YELTA MINE. **AUSTRALIA.**

Sold to Paramatta Copper Mines, Ltd.

YENISEI COPPER CO., LTD. **SIBERIA.**

Offices: 1-2, Great Winchester St., London, E. C., Eng. Mine office: Abakansk, Yenisei, Siberia. T. E. H. Hodgson, chairman; P. J. Brenchley, secretary. Capital, nominal, £300,000; called up, £173,001. Lands include mineral leases of 8,500 acres and timber rights over 470,000 acres, in the province of Yenisei, Siberia. Is opening two mines, which are said to average 5% copper, and contemplates erection of a smelting plant.

YORK HARBOUR COPPER CO., LTD. **NEWFOUNDLAND.**

In voluntary liquidation. Property sold to Humber Cons. Mining & Mfg. Co.

YOSEMITE COPPER MINING & REDUCTION CO. **CALIFORNIA.**

Office: 214 Potomac Bldg., Los Angeles, Cal. Mine office: Daulton, Madera Co., Cal. J. M. Hambleton, president; I. N. Richards, secretary; C. Van Timmons, superintendent. Has auriferous and argentiferous copper ores, in 4 parallel veins, with an 80′ shaft and steam power. Contemplates installation of new machinery.

YOSEMITE & SAMPSON MINES. **UTAH.**

Mine office: Bingham Canyon, Salt Lake Co., Utah.

YREKA COPPER CO. **BRITISH COLUMBIA.**

Office: 515 Fidelity Bldg., Tacoma, Wash. Mine office: Yreka, Vancouver Island, B. C. Employs 100 men. Organized 1901, under laws of Washington, with capitalization $2,000,000, shares $1 par. C. W. Riddell, president; C. D. Lynn, vice-president; S. T. Lewis, secretary and general manager; N. S. Clarke, general superintendent; W. C. Spicer, treasurer. Lands, 16 patented claims, on Comstock Mountain, Quatsino Sound, Vancouver Island, including the Comstock and Superior groups, also 3 unpatented claims in the Victoria district, 2 miles from tidewater, on the eastern side of the island, this latter group, known as the Yreka, being idle. The Superior group has an enormous contact vein, said to show a 200′ outcrop. Development is by open-cut and 3 tunnels, disclosing a large body of auriferous and argentiferous sulphide ore, estimated by company to carry average values of 7% copper, 2 oz. silver and $3 gold per ton. Amount of ore in sight is variously estimated at 2,000,000 to 4,000,000 tons, with perhaps 500,000 tons available for stoping. The mine has a 10-drill air compressor, with direct water power. A 3,600′ Riblet aerial tram, of 600 tons capacity daily, leads to a fine wharf having a 2,500-ton ore bunker. There are also two smaller aerial trams, of 400′ and 800′ length. The company has contracted to ship 100,000 tons of ore to the Crofton smelter, on the strength of which contract the smelter people have advanced considerable sums, and are now mining about 100 tons daily. The officers of the Yreka stand well, and the property is considered promising, though the company does not seem to be in a very strong financial position.

YTTEROEN MINE. NORWAY.

Mined 1,300 tons of cupriferous pyrites in 1900.

YUDA COPPER CO., LTD. AUSTRALIA.

Company did not go to allotment.

SYNDICAT DU YUNNAN. CHINA.

Offices: 404, Salisbury House, London, E. C., Eng., and 32, Rue Louis Le Grande, Paris, France. A. Adam, president; E. Phillips, secretary in London; G. Dargent, secretary in Paris. Consul-general E. Rocher, agent in China. Capital, nominal, £35,000; paid in, £26,281. Has a government concession to exploit mineral deposits and incidentally build railways, canals, etc., in 7 districts of the province of Yunnan, China, on a royalty of 35% to the Chinese government, payable after deduction of 28% of net earnings for interest, sinking fund, and reserve.

YUSPENSSKI MINE. SIBERIA.

Is located approximately 500 miles south of Petropavlovsk, Siberia, which is the nearest railroad point, and is the principal copper producer of the Kirghiz Steppes. Property shows a network of veins, occurring near a contact of slate and acid igneous rocks, ore being mainly bornite, with gangue of quartz and barite, but showing frequent chalcocite and tetrahedrite, with occasional malachite, azurite, cuprite, and native copper. Property has been worked in a small way for 40 years, development being by an open-cut, once 150′ deep, but since caved in, and by vertical shafts sunk in the footwall, crosscuts being driven to the veins. Main shaft is 257′ deep, showing a vein of 17′ average width, carrying about 15% copper. As the services of engineer, assayer and metallurgist are dispensed with, the development and operation of the mine are along exceedingly crude lines. Timbering costs an average of $1.25 per ton of ore mined, owing to poor management. Timbers are insecurely placed and subject to frequent crushes, after which new timbers are installed inside of the old, with the result of eventually reducing the mine openings to impassible dimensions. The smelter is 70 miles from the mine, and ore is hauled thereto in carts. So much ore is lost in transit that the track of the ore-carts is emblazoned by a purple train of bornite, visible for several miles distance. The smelter is known as the Spasski works. The ore is heap-roasted with coal, the process requiring 3 weeks. The roast-heaps are located on the top of a hill, where furious winds prevail, consequently there is much cintering and heavy losses. The smelter has 6 rectangular brick furnaces, of 2½ tons daily capacity each. So poorly are matters managed that a smelter charge of 15 tons of ore requires 54 tons of fuel and flux. Matte is run onto the casting floor, which is of sand, with many pools of water, causing alarming explosions. About half of the matte is removed by tapping and the balance dug out by hand. Slags run about 3% copper and are fed back into the furnace repeatedly, until gradually worn out. The eventual product, however, is a 99.5% blister copper, of excellent quality. Wages are about 20c. per day for miners, and 500 men, women and children are employed about the mines and works.

COMPANHIA DE ZAMBEZIA. PORTUGUESE EAST AFRICA.

Offices: 53, Rua do Alecrim, Lisbon, Portugal and 10, Rue Lafayette, Paris, France. Capital, nominal, 2,700 contos do reis; issued, 2,025 contos do reis. Property is a concession of 60,000 square miles, on either side of the Zambesi and Shire rivers, extending east of latter to the coast, and embracing the ports of Quelimane and Chinde, Portuguese East Africa. Concession includes copper-bearing fields of prospective value.

ZAMBEZIA EXPLORING CO., LTD. PORTUGUESE EAST AFRICA.

Offices: 30-31, Clements Lane, London, E. C., Eng. Tindale White, chairman: L. Dampier, secretary; Capital, nominal, £270,000; issued, £263,145. Has copper claims in the Lomagunda and adjoining districts, also extensive share interests in various South African mining and land companies.

COMPANIA MINERA DE ZAPOTECA. MEXICO.

Office: Laclede Bldg., St. Louis, Mo. Mine office: Ocotlán, Oaxaca, Mexico. Employs 100 men. Organized January, 1903, under laws of West Virginia, with capitalization $1,000,000, shares $1 par. Geo. Riddle, president; P. R. Flitcraft, secretary; Frank A. Vickery, resident director; Wm. W. Thompson, general superintendent; F. J. Tayman, assistant superintendent. Lands, 33 pertenencias, area 81 acres, also 420 acres of miscellaneous lands, in the Taviche district, including the Zapote mine, carrying auriferous copper and silver-lead ores, developed by a 400′ main shaft and a 300′ tunnel. Has steam power, with a 30-h. p. Webster, Camp & Lane double-drum hoist good for depth of 1,000′. Nearest railroad is the Ferrocaril Oaxaca y Ejutla, 8 miles distant. Work of active development was begun in 1903, and is to be pushed vigorously.

ZARAGOZA COPPER & ZINC MINES, LTD. SPAIN.

Offices: 19-21, Queen Victoria St., London, E. C., Eng. A. H. Greenhill, secretary. Capital, nominal, £60,000; issued, £7,000. Organized to acquire mines in Spain, under agreement with Rio Tenido Copper Mines, Ltd.

COMPANIA MINERA ZAUCUDO. COLOMBIA.

Mine office: Medellin, Antioquia, Colombia. Juan de la Posado, superintendent. Operates the Zaucudo and Savalotas mines, producing gold, silver and copper. Has steam power and smelter, employing several hundred men.

ZOMEKI MINE. JAPAN.

Mine office: Ikuno-mura, Abu-gori, Nagato, Japan. Ores are slightly argentiferous chalcopyrite and bornite, associated with sphalerite, galena and pyrrhotite, occurring as lenses and fissure veins, near liparite dikes penetrating clay-slate, sandstone and limestone.

ZONIA COPPER MINING CO. ARIZONA.

Letter returned unclaimed from former mine office, Prescott, Yavapai county, Arizona.

CHAPTER XVI.

General Copper Statistics.

While more compact than in the earlier issues of this work, the present chapter of statistics will be found to contain more matter, and in somewhat better arrangement, as numerous tables have been consolidated, this process being carried, in some instances, so far as to put three and four into one, which is considered fair concentrating practice. As a consequence of this process of consolidation, many of the tables will be found to give information upon two to a dozen points each.

All tables are fully indexed and cross-referenced in the index of the entire book following this chapter, but the following condensed table of contents may be found of assistance in facilitating reference:

World's Copper Production: By Countries, For Nineteenth Century, By Largest Mines, By Various Mines, Estimate for 1903—pages 741 to 748.

American Copper Production: From 1850 to 1902, By States—pages 749–750.

Lake Superior Copper Production: By Mines, Production and Value 1845 to 1903—pages 750 to 752.

American Exports: Exports 1865 to 1902, By Ports, By Destinations—pages 752 to 753.

American Imports:—page 754.

Copper Trade of the World: Detailed Tables by Countries—pages 754 to 759.

Prices and Values: Sundry Tables—pages 760 to 764.

Dividends, Assessments and General Finances: Prices and Sales of Listed American Shares, Dividends of American Mines, Dividends of Lake Superior Mines, Dividends and Assessments of Lake Mines, Capitalization of Lake Copper Companies—pages 764 to 771.

Sundry Local Statistics: Forces Employed by Michigan and Montana Mines, Number of shareholders in Lake Copper Companies—page 772.

Future Production of Copper: Sundry Tables based upon Production of the Nineteenth Century—pages 773 to 774.

WORLD'S COPPER PRODUCTION BY COUNTRIES.

(*Long Tons.*)

Country.	1890.	1896.	1898.	1899.	1900.	1901.	1902.
Algeria..........	120	......	......	......	......	......	......
Argentina.......	150	100	125	65	775	780	240
Australasia......	7,500	11,000	18,000	20,750	23,000	30,875	28,640
Austria.........	1,210	1,075	1,110	915	865	1,015	1,015
Bolivia.........	1,900	2,000	2,050	2,500	2,100	2,000	2,000
Canada.........	3,050	4,000	8,040	6,730	8,500	18,800	17,485
Chile...........	26,120	23,500	24,850	25,000	25,700	30,000	28,930
Cape Colony....	6,450	7,450	7,060	6,490	6,720	6,400	4,450
Great Britain....	935	555	640	650	650	600	600
Germany.......	17,625	20,065	20,085	23,460	20,410	21,720	21,605
Hungary.......	300	210	430	590	490	320	485
Italy...........	2,200	3,400	2,965	2,965	2,955	3,000	3,370
Japan..........	15,000	21,000	25,175	28,310	27,840	27,475	29,775
Mexico..........	4,325	11,150	16,435	19,335	22,050	23,795	35,785
Newfoundland...	1,735	1,800	2,100	2,700	1,900	2,000	2,000
Norway........	1,390	2,500	3,615	3,610	3,935	3,375	4,565
Peru...........	150	740	3,040	5,165	8,220	9,520	7,580
Russia.........	4,800	5,100	6,260	7,210	8,000	8,000	8,000
Sweden.........	830	500	480	520	450	450	455
Spain & Portugal.	51,700	53,325	52,375	52,168	52,872	53,621	49,790
United States....	115,966	205,384	235,050	253,870	269,111	268,522	294,297
Turkey..........	......	....	470	920	520	980	1,100
Venezuela.......	5,640	....	......	......	......	......	......
Totals.........	269,096	374,854	430,405	463,908	486,363	513,243	542,167

WORLD'S COPPER PRODUCTION.

(*Long Tons.*)

Year.	United States.	Foreign.	Total.	Percentage of U. S. Production.
1880..........	27,000	126,959	153,959	17
1881..........	32,000	131,000	163,000	19
1882..........	40,467	141,155	181,622	22
1883..........	51,574	147,832	199,406	24
1884..........	64,708	155,141	220,249	29
1885..........	74,052	151,540	225,592	32
1886..........	70,430	146,656	217,086	32
1887..........	81,017	142,781	223,798	36
1888..........	101,054	156,972	258,026	39
1889..........	101,239	159,966	261,205	
1890..........	115,966	153,489	269,455	
1891..........	126,839	152,552	279,391	
1892..........	154,018	156,454	310,472	
1893..........	147,033	156,497	303,530	
1894..........	158,120	166,385	324,505	
1895..........	169,917	164,648	334,565	
1896..........	205,384	167,979	373,363	
1897..........	220,571	178,384	398,955	
1898..........	235,050	194,106	429,156	
1899..........	253,870	215,440	469,310	
1900..........	269,111	216,743	485,854	
1901..........	268,522	242,497	511,019	
1902..........	294,297	247,870	542,167	

PRODUCTION OF VARIOUS MINES.—(Continued.)

(*Pounds.*)

No.	Mine or Company.	Location.	Year.	Production.
33	Moctezuma	Mexico	1903	10,179,000
34	Mitsu Bishi Gosshi Kwaisha	Japan	1902	10,000,000
35	Trimountain	Michigan, U. S. A.	1903	9,237,051
36	Wolverine	Michigan, U. S. A.	1903	9,024,034
37	Bingham	Utah, U. S. A.	1903	9,000,000
38	United States	Utah, U. S. A.	1903	9,000,000
39	O'okiep	Cape Colony	1902	8,750,000
40	Old Dominion	Arizona, U. S. A.	1903	8,575,776
41	Washoe	Montana, U. S. A.	1903	8,000,000
42	Mason & Barry	Portugal	1902	7,459,200
43	Colorado Mng. & Smelting Co.	Montana	1903	7,000,000
44	Teziutlán	Mexico	1902	6,788,404
45	Mohawk	Michigan, U. S. A.	1903	6,284,327
46	Sulitelma	Norway	1902	6,272,000
47	Shannon	Arizona, U. S. A.	1903	6,250,000
48	Canadian Copper Co.	Canada	1903	6,000,000
49	Great Cobar	Australia	1898	5,644,800
50	Atlantic	Michigan, U. S. A.	1903	5,505,598
51	Namaqua	Cape Colony	1901	5,376,000
52	Franklin	Michigan, U. S. A.	1903	5,309,030
53	Katarski	Russia	1899	4,765,000
54	Le Roi	Canada	1902	4,750,000
55	Santa Ines y Morococha	Peru	1903	4,480,000
56	Mt. Garnet	Australia	1901	4,220,016
57	Carrizal	Chile	1901	4,000,000
58	Tilt Cove	Newfoundland	1902	4,000,000
59	British Columbia	Canada	1903	3,950,000
60	Tyee	Canada	1903	3,604,474
61	Copiapo	Chile	1902	3,500,000
62	Sevilla	Spain	1902	3,460,800
63	Kedabenski	Russia	1902	3,400,000
64	Maipu	Chile	1901	3,350,000
65	Santiago Vicuña	Chile	1901	3,250,000
66	Guggenheim Exploration Co.	Mexico	1902	3,223,125
67	Daly-West	Utah, U. S. A.	1903	3,160,824
68	Central Chile Copper Co	Chile	1901	3,136,000
69	Isle Royale	Michigan, U. S. A.	1903	3,134,601
70	Rudianski	Russia	1899	3,122,112
71	Montecatini	Italy	1903	3,086,440
72	Montreal & Boston	Canada	1903	3,041,104
73	Le Roi No. 2	Canada	1902	3,001,027
74	Huanchaca de Bolivia	Bolivia	1902	3,000,000
75	Artola Hermanos	Chile	1901	3,000,000
76	Sociedad Industrial de Atacama	Chile	1902	3,000,000
77	Chilena de Fundiciones	Chile	1902	3,000,000
78	Ani	Japan	1902	3,000,000
79	Arghana Maden	Turkey	1902	3,000,000
80	Catemu	Chile	1903	2,984,000
81	"Lloyd"	Australia	1902	2,947,200
82	Besa y Ca	Chile	1901	2,912,000
83	Tinto & Santa Rosa	Spain	1902	2,878,400
84	Coro Coro	Bolivia	1901	2,856,000
85	New Chillagoe Railway & Mines	Australia	1903	2,643,200

PRODUCTION OF VARIOUS MINES.—(Continued.)

(*Pounds.*)

No.	Mine or Company.	Location.	Year.	Production.
86	Bogoslovski	Russia	1899	2,634,767
87	Mass Consolidated	Michigan, U. S. A.	1903	2,576,447
88	Rammelsberg	Germany	1902	2,500,000
89	Bully Hill	California, U. S. A.	1903	2,500,000
90	Speculator	Montana, U. S. A.	1903	2,500,000
91	Dolores y Anexas	Mexico	1902	2,481,832
92	Osaruzawa	Japan	1902	2,448,000
93	Noel Berthini	Bolivia	1901	2,419,200
94	Adventure	Michigan, U. S. A.	1903	2,182,608
95	Kosaka	Japan	1900	2,168,756
96	Sado	Japan	1901	2,150,000
97	Ducktown	Tennessee, U.S.A.	1903	2,000,000
98	Queensland Copper Co.	Australia	1902	1,928,640
99	Sucesion Cervero	Chile	1902	1,792,000
100	Sotiel Coronada	Spain	1899	1,780,800
101	San Miguel	Spain	1899	1,767,360
102	Arakawa	Japan	1900	1,734,522
103	Mungana (Chillagoe)	Australia	1903	1,612,800
104	Snowshoe	British Columbia.	1903	1,600,000
105	Sucesion P. Gonzales	Chile	1901	1,568,000
106	Utah & Eastern	Utah, U. S. A.	1903	1,550,000
107	Nymagee	Australia	1901	1,500,000
108	Paramatta	Australia	1903	1,500,000
109	Orito	Chile	1902	1,500,000
110	Felix Vicuña	Chile	1902	1,500,000
111	Castillo del Buitron	Spain	1901	1,500,000
112	Panuco	Mexico	1902	1,466,059
113	Western (Indian Queen)	Montana, U. S. A.	1903	1,400,000
114	Peña	Spain	1902	1,397,760
115	Rōros	Norway	1898	1,383,077
116	Jimulco	Mexico	1902	1,369,056
117	Sucesion C. J. Lambert	Chile	1901	1,350,000
118	Sucesion Ramon F. Ovalle	Chile	1901	1,350,000
119	Obie	Japan	1899	1,316,745
120	Galizurski	Russia	1899	1,313,261
121	Las Herrerias	Spain	1901	1,300,714
122	Staatberger	Germany	1901	1,300,000
123	Gulf Creek	Australia	1901	1,254,400
124	Lake George	Australia	1901	1,250,000
125	Makamine	Japan	1900	1,208,282
126	Chiapas	Mexico	1901	1,189,440
127	Van Anda	Canada	1900	1,127,533
128	Yoshioka	Japan	1900	1,081,346
129	Itsuki	Japan	1900	1,080,163
130	Helsingborg	Sweden	1901	1,078,384
131	Winona	Michigan, U. S. A.	1903	1,036,944
132	Ogoya	[illegible]	1899	1,015,759
133	Burraga	[illegible]	[illegible]	[illegible]
134	Great Centr	[illegible]	[illegible]	[illegible]
135	Graslitz	[illegible]	[illegible]	[illegible]
136	J. K. Ch	[illegible]	[illegible]	[illegible]
137	Nichols	[illegible]	[illegible]	[illegible]
138	Guillerm	[illegible]	[illegible]	[illegible]

PRODUCTION OF VARIOUS MINES.—(Continued.)

(*Pounds.*)

No.	Mine or Company.	Location.	Year	Production.
139	Llallai	Chile	1901	1,000,000
140	Maitenes	Chile	1901	1,000,000
141	Puquios	Chile	1901	1,000,000
142	Capanne Vecchie e Poggio Bindo	Italy	1901	1,000,000
143	Komaki	Japan	1900	1,000,000
144	Aguascalientes Metal Co.	Mexico	1903	1,000,000
145	Rio Tinto Mexicana	Mexico	1902	1,000,000
146	Killingdal	Norway	1901	1,000,000
147	Aljustrel	Portugal	1901	1,000,000
148	Cabezas del Pasto	Spain	1901	1,000,000
149	Standard	Arizona, U. S. A.	1903	1,000,000
150	Santa Fe	New Mexico, U.S.A.	1901	1,000,000
151	Santa Rita	New Mexico	1903	1,000,000
152	Person	N'thCarolina,U.S.A.	1902	1,000,000
153	Copperfield	Vermont, U. S. A.	1903	1,000,000
154	Ikuno	Japan	1900	984,355
155	Blayney	Australia	1901	936,320
156	Mond Nickel Co.	Canada	1901	917,600
157	United Globe	Arizona, U. S. A.	1901	830,100
158	Centennial	Michigan, U. S. A.	1901	806,400
159	Pitkaranta	Finland	1897	760,500
160	Blinman	Australia	1902	750,000
161	Kupferplatte	Austria	1901	750,000
162	War Eagle	Canada	1901	750,000
163	White Knob	Idaho, U. S. A.	1903	750,000
164	Horn Silver	Utah, U. S. A.	1902	717,353
165	Stora Kopparberg	Sweden	1902	700,000
166	Majestic	Utah, U. S. A.	1903	693,600
167	Kargalinski	Russia	1899	680,674
168	Broken Hill	Australia	1901	675,000
169	Sociedad Española de Fundicion	Chile	1901	675,000
170	Carisa	Utah, U. S. A.	1903	660,000
171	Girilambone	Australia	1898	650,000
172	Furokura	Japan	1900	615,489
173	Omodani	Japan	1900	614,438
174	Carreras Hermanos	Bolivia	1902	600,000
175	Francisco de P. Perez	Chile	1901	600,000
176	Nagamatsu	Japan	1900	578,744
177	Kusakura	Japan	1900	578,544
178	Hisanichi	Japan	1900	566,268
179	Dogamaru	Japan	1900	551,164
180	Ligure Ramifera	Italy	1901	550,000
181	Aamdal	Norway	1895	537,600
182	Gertrude	Canada	1902	525,000
183	Rossland Great Western	Canada	1902	525,000
184	Dzansulski	Russia	1899	505,568
185	El Cobre	Cuba	1903	500,000
186	Tzarevo-Alexandrovski	Siberia	1900	500,000
187	North American Copper Co.	Wyoming	1903	500,000
188	Libiola	Italy	1902	485,385
189	Brixlegg	Austria	1902	485,012
190	Hampden	Australia	1901	431,692
191	Mendoza y Ca	Mexico	1902	429,897

PRODUCTION OF VARIOUS MINES.—(Continued.)

(*Pounds.*)

No.	Mine or Company.	Location.	Year.	Production.
192	Spence	California, U.S.A.	1902	425,000
193	Mount Molloy	Australia	1902	400,000
194	Funatsu	Japan	1902	400,000
195	Val Verde	Arizona, U. S. A.	1903	379,639
196	Nafverberg	Sweden	1901	375,000
197	Kokusei	Japan	1899	348,497
198	Geisse Hermanos	Chile	1901	335,000
199	Otto Harnecker	Chile	1901	335,000
200	Cobar Chesney	Australia	1902	325,000
201	Las Vigas	Mexico	1903	300,000
202	New Mount Hope	Australia	1898	293,440
203	Michigan	Michigan, U. S. A.	1903	275,708
204	Sasagatini	Japan	1900	274,512
205	Canyon Copper Co.	Arizona, U. S. A.	1903	270,000
206	Hall	Canada	1903	250,880
207	Hamley	Australia	1901	250,000
208	Bossmo	Norway	1902	250,000
209	Lower Mammoth	Utah, U. S. A.	1901	250,000
210	Rambler	Wyoming, U. S. A.	1903	249,196
211	Omaki	Japan	1896	242,690
212	Mt. Morgan Gold	Australia	1903	237,440
213	Einasleigh	Australia	1901	232,960
214	Clemente Ham	Mexico	1902	231,830
215	Ate	Japan	1900	231,484
216	Burra Burra	Australia	1903	225,000
217	Quilomenco	Chile	1901	225,000
218	Francisco Vergara I.	Chile	1901	225,000
219	Kafveltorps	Sweden	1901	214,919
220	Phoenix	Michigan, U. S. A.	1903	202,823
221	Mizusawa	Japan	1900	200,331
222	J. M. Echevarria	Chile	1902	200,000
223	Tsuboi	Japan	1900	183,876
224	Nishinokawa	Japan	1900	183,415
225	Merisski	Russia	1899	164,092
226	Alverdski & Shamblurgski	Russia	1899	162,142
227	Kurotaki	Japan	1900	151,890
228	Castellanos y Ca.	Chile	1902	150,000
229	Hogasho	Japan	1900	138,032
230	Kune	Japan	1898	137,686
231	Sawatari	Japan	1900	137,191
232	Atvidaberg	Sweden	1901	134,412
233	Papovski	Siberia	1899	129,497
234	Hisamune	Japan	1899	112,196
235	Turgovski	Russia	1900	111,686
236	Maze	Japan	1900	110,582
237	Silver Spur	Australia	1903	110,000
238	Irigoyen Hermanos y Ca.	Mexico	1902	107,804
239	Higashiyama	Japan	1898	104,424
240	Hecla Consolidated	Montana, U.S.A.	1901	103,671
241	Dingo	Australia	1901	100,000
242	José R. Espinoza	Chile	1902	100,000
243	Sucesion Francisco Geisse	Chile	1901	100,000
244	Yamate	Japan	1901	100,000
245	Quintera	Mexico	1902	100,000

ESTIMATE OF WORLD'S PRODUCTION IN 1903.

The following table gives actual figures of output of refined copper by the various copper producing countries of the world for the year 1902, and estimates of production for the year 1903. As final figures of production will not be available until the latter half of 1904, the table must be taken merely for what it purports to be—that is, a careful estimate, based upon the best data available early in the year, of the actual production of the previous year. The variation shown by the actual figures from the estimates herewith will be small in most cases.

(*Long Tons.*)

Country.	1902.	1903.
Argentina	240	500
Australasia	28,640	30,500
Austria	1,015	1,250
Bolivia	2,000	2,000
Canada	17,485	22,000
Cape Colony	4,450	4,500
Chile	28,930	31,000
Germany	21,605	22,000
Great Britain	600	500
Hungary	485	750
Italy	3,370	3,500
Japan	29,775	31,000
Mexico	35,785	48,000
Newfoundland	2,000	2,000
Norway	4,565	5,000
Peru	7,580	6,000
Russia	8,000	8,000
Sweden	455	500
Spain & Portugal	49,790	50,000
Turkey	1,100	1,000
United States	294,297	311,000
Totals	542,167	581,000

Giving the following increases, actual and estimated: United States, 7.9% in 1902 and 5.7% in 1903; all other countries, 2.2% in 1902 and 8.8% in 1903; whole world 6.1% in 1902 and 7.2% in 1903. As the normal increase in copper consumption is 6,5%, plus the electrical demand, production is no more than keeping pace with consumption, despite the large number of new mines being opened,

AMERICAN COPPER PRODUCTION.

(*Long Tons.*)

Year.	United States Total Production	Michigan Production	Michigan Per cent of total	Montana Production	Montana Per cent of total	Arizona Production	Arizona Per cent of total
1850........	650	572	88	....	..	......	..
1851........	900	779	86	....	..	......	..
1852........	1,100	792	72	....	..	......	..
1853........	2,000	1,297	65	....	..	......	..
1854........	2,250	1,819	81	....	..	......	..
1855........	3,000	2,593	86	....	..	......	..
1856........	4,000	3,666	91	....	..	......	..
1857........	4,800	4,255	88	....	..	......	..
1858........	5,500	4,088	74	....	..	......	..
1859........	6,300	3,985	63	....	..	......	..
1860........	7,200	5,388	74	....	..	......	..
1861........	7,500	6,713	89	....	..	......	..
1862........	9,000	6,065	67	....	..	......	..
1863........	8,500	5,797	68	....	..	......	..
1864........	8,000	5,576	69	....	..	......	..
1865........	8,500	6,410	75	....	..	......	..
1866........	8,900	6,138	69	....	..	......	..
1867........	10,000	7,824	78	....	..	......	..
1868........	11,600	9,346	80	....	..	......	..
1869........	12,500	11,886	95	....	..	......	..
1870........	12,600	10,992	87	....	..	......	..
1871........	13,000	11,942	91	....	..	......	..
1872........	12,500	10,961	87	....	..	......	..
1873........	15,500	13,433	86	....	..	......	..
1874........	17,500	15,327	87	....	..	......	..
1875........	18,000	16,089	89	....	..	......	..
1876........	19,000	17,085	89	....	..	......	..
1877........	21,000	17,422	83	....	..	......	..
1878........	21,500	17,719	82	....	..	......	..
1879........	23,000	19,129	83	....	..	......	..
1880........	27,000	22,204	82	....	..	......	..
1881........	32,000	24,363	76	....	..	......	..
1882........	40,467	25,439	62	....	..	......	..
1883........	51,574	26,653	51	11,011	21	10,658	21
1884........	64,708	30,961	47	19,256	30	11,935	18
1885........	74,052	32,209	43	30,267	41	10,137	14
1886........	70,430	36,124	51	25,362	36	6,990	10
1887........	81,017	33,941	42	35,133	43	7,910	10
1888........	101,054	38,604	38	43,704	43	14,195	14
1889........	101,239	39,364	38	43,849	43	13,654	13
1890........	115,966	45,273	39	50,437	43	15,534	13
1891........	126,839	50,992	40	50,028	39	17,800	14
1892........	154,018	54,999	36	72,860	47	17,160	11
1893........	147,033	50,270	34	69,290	47	19,200	13
1894........	158,120	51,031	32	81,729	52	19,873	13
1895........	169,917	57,737	34	84,900	50	21,408	13
1896........	205,384	63,418	31	99,071	48	32,560	16
1897........	220,571	63,706	29	102,807	47	36,398	17
1898........	235,050	66,056	28	92,041	39	49,624	21
1899........	253,870	65,603	26	100,503	40	59,399	23
1900........	269,111	63,461	24	120,865	45	52,820	20
1901........	268,522	69,501	26	102,620	38	58,383	22
1902........	294,297	76,050	26	128,975	44	53,546	1

UNITED STATES COPPER PRODUCTION BY STATES.

1898–1902.

(*Pounds.*)

State.	1899.	1900.	1901.	1902.
Montana	225,126,855	270,738,489	229,870,415	288,903,820
Michigan	146,950,338	142,153,171	155,604,145	170,325,598
Arizona	133,054,860	118,317,764	130,778,611	119,944,944
California	26,221,897	28,511,225	33,667,456	25,038,724
Utah	9,584,746	18,354,726	20,116,979	23,939,901
Colorado	11,643,608	7,826,949	9,801,783	8,422,030
East and South	4,410,554	4,820,495	6,860,039	13,599,047
New Mexico	3,935,441	4,169,400	9,629,884	6,614,961
Wyoming	3,104,827	4,203,776	2,698,712	889,228
South Dakota	17,020	15,147	753,510	445,663
Nevada	556,775	407,535	593,608	164,301
Idaho	110,000	290,162	480,511	227,500
Miscellaneous	3,500,000	3,000,000	531,530	500,000
Total domestic	568,216,921	602,808,839	601,499,886	659,225,014
From imported ores and matte	23,800,000	36,380,000	64,000,000	40,000,000
Gross Production	592,016,921	639,188,839	665,499,886	699,225,014

LAKE SUPERIOR COPPER PRODUCTION BY MINES.

1900–1903.

The figures in the following table are official and final. Asterisks denote estimates.

(*Pounds Avoirdupois.*)

Mines.	1903.	1902.	1901.	1900.
Calumet & Hecla	76,490,869	81,248,739	82,519,676	77,761,382
Quincy	18,498,288	18,988,491	20,540,720	14,116,551
Osceola	16,059,636	13,416,396	13,723,487	12,566,471
Tamarack	15,286,093	15,961,528	18,000,852	19,182,502
Baltic	10,580,997	6,285,819	2,641,432	1,735,060
Champion	10,564,147	4,165,784	....	....
Trimountain	9,237,051	5,732,160	....	....
Wolverine	9,024,034	6,473,181	4,946,126	4,789,829
Mohawk	6,284,327	226,824	160,897	....
Atlantic	5,505,598	4,949,366	4,666,880	4,930,149
Franklin	5,309,030	5,237,460	3,757,419	3,663,710
Isle Royale	3,134,601	3,569,748	2,171,955	....
Mass	2,576,447	2,345,805	837,297	122,239
Adventure	2,182,608	606,211	29,361	23,572
Winona	1,036,944	101,188	....	....
Michigan	275,708	166,898	....	33,601
Phoenix	202,823	....	93,643	88,206
Arcadian	....	*600,000	*500,000	*1,350,000
Centennial	....	....	806,400	892,500
Arnold	....	....	108,000	856,000
Miscellaneous	*50,000	*250,000	*50,000	73,400
Totals	192,299,191	170,325,598	155,604,145	142,151,571

PRODUCTION, VALUE AND DIVIDENDS OF LAKE COPPER.

Year.	Gross Product fine copper (Pounds).	Gross value of production (Dollars).	Total Dividends paid (Dollars).	Percentage of dividends to gross values.	Dividends per pound of copper (Cents).
1845....	24,880	5,000	....	....	.....
1846....	58,240	10,000	....	....	.....
1847....	297,120	55,000	....	....	.....
1848....	1,032,640	200,900	....	....	.....
1849....	1,505,280	336,000	60,000	17.0	3.98
1850....	1,281,280	286,000	84,000	29.0	6.55
1851....	1,744,960	289,500	60,000	12.0	3.43
1852....	1,774,080	396,000	60,000	15.0	3.38
1853....	2,905,280	648,500	90,000	14.0	3.09
1854....	4,074,560	909,500	198,000	21.0	4.85
1855....	5,809,334	1,586,160	168,000	10.0	2.89
1856....	8,217,392	2,218,320	380,000	17.0	4.62
1857....	9,530,830	2,382,500	480,000	20.0	5.03
1858....	9,159,916	2,129,235	460,000	21.0	5.00
1859....	8,937,995	1,950,355	360,000	18.0	4.02
1860....	12,068,375	2,654,960	120,000	5.0	0.99
1861....	15,182,837	3,487,995	260,000	7.0	1.70
1862....	13,586,318	3,634,255	440,000	12.0	3.23
1863....	12,985,444	4,415,600	720,000	16.0	5.54
1864....	12,491,965	5,870,300	1,150,000	19.0	9.20
1865....	14,358,592	5,635,515	510,000	9.0	3.55
1866....	13,750,063	4,629,375	170,000	3.7	1.23
1867....	17,515,607	4,442,841	110,000	2.4	0.63
1868....	20,934,124	4,940,424	100,000	2.0	0.47
1869....	26,625,301	6,230,016	210,000	3.4	0.78
1870....	24,622,759	5,096,752	700,000	13.0	2.84
1871....	25,746,448	5,728,485	1,640,000	29.0	6.36
1872....	24,553,523	7,979,400	3,080,000	38.0	11.54
1873....	30,291,505	8,726,100	2,330,000	27.0	7.69
1874....	34,334,389	8,009,356	1,940,000	24.0	5.06
1875....	36,039,497	8,180,625	1,920,000	23.0	5.32
1876....	38,270,997	7,998,430	1,870,000	23.0	4.88
1877....	39,026,671	7,327,880	1,840,000	25.0	4.71
1878....	41,687,266	6,920,540	1,860,000	27.0	4.46
1879....	42,671,529	7,327,350	1,818,620	25.0	4.26
1880....	49,718,337	9,947,673	3,080,000	30.9	6.19
1881....	54,548,909	9,971,702	2,665,000	26.7	4.88
1882....	57,155,980	10,522,416	2,850,000	27.1	4.99
1883....	59,702,404	9,457,853	2,670,000	28.1	4.47
1884....	69,353,202	9,494,306	1,327,500	12.9	1.91
1885....	72,147,889	7,942,597	1,970,000	24.8	2.73
1886....	80,918,460	8,788,476	1,900,000	21.5	2.34
1887....	76,028,697	8,530,342	1,370,000	16.1	1.80
1888....	86,472,034	14,510,001	3,260,000	22.4	3.77
1889....	88,175,675	11,894,942	2,670,000	22.4	3.03
1890....	101,410,277	15,819,960	3,415,000	21.6	3.36
1891....	114,222,709	14,574,727	3,540,000	24.3	[illegible]10
1892....	123,198,460	12,431,624	3,260,000	26.2	[illegible]
1893....	112,605,078	12,105,145	3,520,000	29.1	
1894....	114,308,870	10,852,122	2,380,000	21.9	
1895....	129,330,749	13,877,109	3,280,000	23.6	
1896....	142,057,500	15,758,935	3,985,000	25.3	
1897....	142,702,586	16,530,843	5,431,000	32.8	

PRODUCTION, VALUE AND DIVIDENDS OF LAKE COPPER.—Cont'd.

Year.	Gross Product fine copper (Pounds.)	Gross value of production (Dollars.)	Total Dividends paid (Dollars.)	Percentage of dividends to gross values.	Dividends per pound of copper (Cents.)
1898	147,965,738	17,829,871	6,857,250	38.4	4.63
1899	146,950,338	26,098,382	12,318,450	47.2	8.39
1900	142,151,571	23,691,928	9,811,200	41.3	6.90
1901	155,716,848	26,038,857	7,496,900	28.8	4.81
1902	170,325,598	20,711,592	3,440,000	16.6	2.02
1903	192,299,191	26,383,449	4,980,000	18.8	2.59
Totals	3,171,871,504	486,193,130	122,665,920	25.2	3.86

AMERICAN COPPER EXPORTS.

The United States government estimates of exports of copper, including ingot and various forms of refined copper, matte, blister copper and ores, and manufactured products, from 1864 until 1902, inclusive are as follows:

(*Cwts. and Pounds.*

Year Ending—	Ore and Matte. Cwts.	Refined. Pounds.	Total Value.
June 30, 1864	109,581	102,831	$ 432,570
1865	225,197	1,572,382	1,544,870
1866	215,080	123,444	936,211
1867	87,731	4,637,867	791,901
1868	92,612	1,350,896	922,409
1869	121,418	1,134,360	592,698
1870	19,198	2,214,658	1,042,246
1871	54,445	581,650	915,431
1872	35,564	267,868	287,735
1873	45,252	38,958	259,076
1874	13,326	503,160	467,208
1875	51,305	5,123,470	1,815,266
1876	15,304	14,304,160	3,526,410
1877	21,432	13,461,553	3,023,394
1878	32,947	11,297,876	2,488,921
1879	23,070	17,207,739	2,933,205
1880	21,623	4,206,258	849,218
1881	9,958	4,865,407	876,395
1882	25,936	3,340,531	748,456
1883	112,923	8,221,363	2,348,004
1884	386,140	17,044,760	5,595,859
1885	432,300	44,731,858	10,187,024
Dec. 31, 1886	417,520	19,553,421	4,380,322
1887	501,280	12,471,393	4,114,456
1888	794,960	31,706,527	11,897,240
1889	818,500	16,813,410	10,209,722
1890	431,411	10,971,899	5,918,395
1891	672,120	69,279,024	15,703,543
1892	943,040	30,515,736	10,162,870
1893	835,040	138,984,128	18,935,497
1894	87,040	162,393,000	16,143,094
1895	276,480	121,328,390	14,938,309
1896	414,265	259,223,924	31,035,211
1897	181,280	277,255,742	32,755,053
1898	186,860	291,955,905	35,545,251
1899	74,540	246,826,331	43,485,654
1900	200,140	337,973,751	58,875,439
1901	292,260	194,249,828	36,071,448
1902	201,992	354,668,849	46,811,729

AMERICAN EXPORTS OF REFINED COPPER.

1893–1902.

The following figures, showing American exports of copper, in long tons, from 1893 to 1902, inclusive, are furnished by Mr. John Stanton, of New York, secretary of the American Copper Producers' Association:

(*Long Tons.*)

Year	Exports.
1893	80,392
1894	77,527
1895	64,722
1896	125,605
1897	129,210
1898	145,115
1899	119,811
1900	160,082
1901	94,366
1902	164,451

AMERICAN EXPORTS BY PORTS.

(*Pounds.*)

Port of Export.	1899.	1900.	1901.	1902.
Baltimore	90,786,853	86,264,231	54,377,355	103,607,256
Boston	1,568,197	1,496,387	27,917	426,069
Newport News, Va.	4,085,580	2,016,000	1,568,567	5,070,026
Norfolk, Va.	4,707,267	....	....	598,339
New York	134,412,540	230,178,643	133,540,150	236,622,515
Philadelphia	2,733,692	12,468,680	3,526,130	5,804,743
New Orleans	7,459,623	3,937,350	1,806	1,819
Galveston	3,700	....	....	....
Detroit	320,121	469,819	387,923	812,828
Port Huron, Mich.	107,562	149,525	92,062	208,849
Burlington, Vt.	434,340	678,589	434,692	....
Miscellaneous	206,856	314,527	293,226	1,516,405
Totals	246,826,331	337,973,751	194,249,828	354,668,849

AMERICAN COPPER EXPORTS BY DESTINATIONS.

(*Pounds.*)

Destination.	1899.	1900.	1901.	1902.
Great Britain and Ireland.	50,675,849	63,522,445	36,819,100	88,972,029
Holland	69,304,669	101,398,394	61,752,002	96,358,472
France	53,909,508	67,725,989	34,607,042	63,519,881
Germany	49,285,139	67,348,848	37,487,180	56,604,753
Belgium	5,069,456	12,554,191	4,561,405	8,431,560
Austria-Hungary	6,354,287	11,258,115	8,616,964	28,539,742
Russia	2,689,610	5,650,423	2,889,270	
Italy	3,449,565	5,550,285	5,045,775	9,108,904
Other Countries	1,546,860	2,965,061	2,471,090	3,133,508
Totals	246,826,331	337,973,751	194,249,828	354,668,849

AMERICAN IMPORTS OF COPPER.

The following table showing imports of copper into the United States, in various forms, is summarized from the official figures of the United States government. The figures are somewhat unsatisfactory, for the reason that after and including 1895 the figures of ore are for gross weight of imported ore, while for preceding years the figures are for copper content of the ore:

(*Pounds.*)

Year.	Ore.	Copper in Matte.	Raw Copper.	Old Copper.	Estimated Total.
1890...	3,448,237	221,838	5,189	284,789	3,960,053
1891...	8,931,554	2,403,919	2,556	134,407	11,472,436
1892...	7,669,978	303,087	22,097	71,485	8,066,647
1893...	7,256,015	3,175,559	554,348	59,375	11,045,297
1894...	4,804,614	5,873,820	606,415	160,592	11,445,441
1895...	*a*8,921,920	*a*3,104,640	7,979,322	1,336,901	....
1896...	*a*2,620,800	*a*3,427,200	9,074,379	2,422,554	....
1897...	*a*43,919,680	2,974,720	12,646,552	1,780,390	28,923,098
1898....	*a*107,253,440	1,583,680	5,892,944	1,986,133	73,916 467
1899...	*a*120,934,616	7,763,885	64,282,583	6,678,145	95,722,340
1900...	*a*109,123,840	27,534,080	62,404,489	3,354,756	105,176,808
1901...	*a*131,790,400	75,913,600	71,001,713	2,818,757	137,826,406
1902...	*a*334,010,800	52,978,240	112,420,253	2,119,031	194,501,757

a. Gross weight of ore.

COPPER IMPORTED FOR AMERICAN CONSUMPTION.

Of the copper imported into the United States, 1890-1902, inclusive, the following amounts have been entered at the custom-houses for American consumption:

(*Pounds.*)

Year.	New Copper.	Old Copper.	Total.	Value.
1890........	5,189	284,789	289,978	$ 27,322
1891........	2,556	134,407	136,963	10,074
1892........	22,097	71,485	93,582	8,702
1893........	554,338	59,375	613,713	65,425
1894........	606,415	160,592	767,007	58,414
1895........	7,979,322	1,336,901	9,316,223	836,687
1896........	9,074,379	2,422,554	11,496,933	947,395
1897........	12,646,552	1,780,390	14,426,942	1,301,355
1898........	35,892,944	1,986,133	37,879,077	3,262,946
1899........	64,282,583	6,678,145	70,960,728	10,108,592
1900........	62,404,489	3,354,756	65,759,245	10,305,016
1901........	71,001,713	2,818,757	73,820,470	11,804,281
1902........	112,420,253	2,119,031	114,539,284	12,834,970

AMERICAN COPPER SUPPLY.

(*Pounds.*)

Year.	Domestic Produc'n.	Imports.	Total Supply.	Exports.	Net Supply.
1892...	344,998,679	8,066,647	353,065,326	96,515,736	256,549,590
1893...	329,354,398	11,045,297	340,399,695	188,984,128	151,415,567
1894...	354,188,374	11,445,441	365,633,815	168,143,000	197,490,815
1895...	380,613,404	14,616,223	395,229,627	136,528,390	258,701,237
1896...	460,061,430	17,297,272	477,358,702	282,105,860	195,252,842
1897...	494,078,274	28,578,420	522,656,694	288,662,340	233,994,354
1898...	526,512,987	73,916,467	600,429,454	321,023,873	279,405,581
1899...	568,666,921	95,722,340	664,389,261	252,876,480	411,512,781
1900...	606,117,166	105,176,808	711,293,974	348,402,853	362,891,121
1901...	602,072,519	137,826,406	739,898,925	222,137,911	517,761.014
1902...	659,225,014	194,501.757	853,726.771	354.668.849	499.057 922

AMERICAN COPPER TRADE.

This table, compiled by the Metallegesellschaft & Metallurgische Gesellschaft A.-G., of Frankfort-on-Main, Germany, is based upon the official statistics of the United States government. The production, given in the first column, includes copper produced from imported ores and matte, as well as copper from domestic ore and regulus:

(*Metric Tons.*)

Year.	Production.	Imports.	Exports.	Supply.
1892	151,163	784	43,004	108,943
1893	152,272	2,512	87,492	67,292
1894	164,095	1,563	77,089	88,569
1895	178,341	4,253	63,759	118,835
1896	219,328	5,186	128,548	95,966
1897	230,185	7,543	131,730	105,998
1898	250,000	24,646	150,721	123,925
1899	273,000	32,516	116,629	188,887
1900	283,000	31,303	160,403	153,900
1901	317,500	33,600	110,500	240,600
1902	341,100	46,925	184,800	203,225

BRITISH AND FRENCH STOCKS OF COPPER.

The following table gives the estimates of stocks of refined copper on hand in Great Britain and France, on the first day of January of each year named. The first column gives actual stocks on hand, the second column giving the "visible supply," which in addition to stocks on hand includes shipments afloat from Chile and Australia to European ports:

(*Long Tons.*)

Year.	Public Stocks.	Visible Supply.
1888	35,001	......
1889	96,194	104,091
1890	94,942	98,847
1891	62,449	65,366
1892	53,486	......
1893	51,556	......
1894	43,428	......
1895	51,575	......
1896	43,604	45,817
1897	31,776	34,927
1898	27,895	31,955
1899	22,346	27,913
1900	17,517	22,935
1901	24,435	28,921
1902	15,701	22,063
1903	11,215	16,540
1904	5,601	13,851

ENGLISH COPPER TRADE.

(*Long Tons.*)

Year.	Imports Copper.	Imports Ore and Matte.	Imports Total.	Exports.	Apparent Consumption.
1860........	13,142	13,715	26,857	26,117	......
1865........	23,137	23,922	47,059	41,398	......
1870........	30,724	27,025	57,749	53,006	......
1871........	33,228	23,671	56,899	56,633	......
1872........	49,000	21,702	70,702	53,195	......
1873........	35,840	26,756	62,596	55,716	......
1874........	39,906	27,894	67,800	59,742	......
1875........	41,931	29,483	71,414	51,870	......
1876........	39,145	36,191	75,336	52,468	......
1877........	39,743	53,582	93,325	54,088	......
1878........	39,360	48,212	87,572	55,001	......
1879........	46,670	50,421	97,091	62,412	30,774
1880........	36,509	56,225	92,734	59,482	32,879
1881........	32,170	54,057	86,227	61,689	31,607
1882........	35,509	58,366	93,875	55,683	42,877
1883........	35,653	63,493	99,146	59,350	40,469
1884........	39,767	69,623	109,390	64,691	51,263
1885........	41,933	81,616	123,549	62,080	54,323
1886........	42,969	65,046	108,015	60,511	41,158
1887........	29,198	73,891	103,089	69,453	53,096
1888........	44,063	90,867	135,470	*a*72,066	42,562
1889........	*b*38,576	101,407	139,983	75,627	65,759
1890........	*c*49,461	91,788	141,249	89,747	66,170
1891........	44,213	94,403	138,616	76,056	59,223
1892........	*d*35,015	99,356	134,371	82,542	*e*48,367
1893........	41,829	88,003	129,832	70,986	66,817
1894........	56,157	68,851	125,008	54,689	*f*50,330
1895........	42,135	77,806	119,941	65,990	*f*50,692
1896........	60,458	75,398	135,856	59,334	*f*76,036
1897........	60,428	76,127	136,555	56,542	*f*69,787
1898........	67,978	71,726	139,704	63,256	*f*69,284
1899........	58,880	82,730	141,610	75,271	*f*60,877
1900........	70,247	84,694	154,941	56,997	*f*81,896
1901........	66,764	82,814	149,578	70,396	*f*70,178
1902........	90,022	70,179	160,201	69,156	*f*80,223

a. Including 22,557 *tons of Chile bars transferred to France.*

b. Including 1,166 *tons of Chile bars transferred from France to England.*

c. Including 3,501 *tons of Chile bars transferred from France to England.*

d. Including 3,585 *tons of Chile bars transferred from France to England.*

e. Add 4,001 *tons for comparison with former years, the difference arising from the new method of making up stock.*

f. Deducting copper contents of sulphate exported (13,078 *tons in* 1898, 10,045 *tons in* 1899, 10,728 *tons in* 1900, 9,004 *tons in* 1901 *and* 10,822 *tons in* 1902.

GERMAN COPPER TRADE.

(Compiled by Metallegesellschaft & Metallurgische Gesellschaft A.-G.)

(*Metric Tons.*)

Year.	Production.	Imports.	Exports.	Consumption.
1884	18,113	13,819	6,906	25,026
1885	19,928	13,168	5,706	27,390
1886	19,314	11,913	6,510	24,717
1887	20,192	12,427	5,154	27,465
1888	21,017	8,082	4,530	24,569
1889	24,160	29,643	7,135	46,668
1890	24,427	31,408	8,428	47,407
1891	24,092	34,182	6,247	52,027
1892	24,781	32,498	6,598	50,681
1893	24,011	38,455	7,517	54,949
1894	25,722	37,032	6,609	56,145
1895	25,777	44,365	6,329	63,813
1896	29,319	56,115	5,996	79,438
1897	29,408	67,573	7,183	89,798
1898	30,695	73,291	6,972	97,014
1899	34,634	70,091	7,061	97,664
1900	30,929	83,503	5,505	108,927
1901	31,317	58,620	5,097	84,840
1902	30,591	76,050	4,678	101,963

FRENCH COPPER TRADE.

(*Metric Tons.*)

Year.	Production	Imports.	Exports.	Consumption.
1892	6,400	24,154	2,116	28,438
1893	6,600	26,060	2,204	30,456
1894	6,400	26,756	2,467	30,689
1895	8,245	32,656	3,163	37,738
1896	6,544	40,136	3,456	43,224
1897	7,400	48,028	3,559	51,869
1898	7,834	45,575	4,044	49,365
1899	6,600	49,515	6,882	49,233
1900	6,400	51,962	5,736	52,626
1901	7,000	41,196	5,122	43,074
1902	7,300	49,094	3,485	52,909

AUSTRO-HUNGARIAN COPPER TRADE.

(*Metric Tons.*)

Year.	Production.	Imports.	Exports.	Consumption.
1892	1,295	8,644	342	9,597
1893	1,396	11,822	434	12,784
1894	1,726	13,383	255	14,854
1895	1,276	11,747	151	12,872
1896	1,366	13,666	228	14,804
1897	1,426	15,926	159	17,193
1898	1,343	17,442	173	18,612
1899	1,479	16,185	534	17,130
1900	1,200	18,970	471	19,699
1901	1,150	17,504	435	18,219
1902	1,350	18,256	436	19,170

RUSSIAN COPPER TRADE.

Metric Tons.

Year.	Production.	Imports.	Exports.	Consumption.
1892........	4,975	[illegible]	....	11,546
1893........	5,100	[illegible]	....	13,856
1894........	5,486	[illegible]	....	12,075
1895........	5,554	[illegible]	....	13,954
1896........	5,822	[illegible]	....	18,265
1897........	[illegible]	[illegible]	....	19,448
1898........	7,291	10,200	....	17,491
1899........	7,523	[illegible]	....	13,833
1900........	8,100	6,100	....	14,200
1901........	8,100	6,000	....	14,100
1902........	8,800	8,700	...	17,500

ITALIAN COPPER TRADE.

Metric Tons.

Year.	Production.	Imports.	Exports.	Consumption.
1892...........	2,564	[illegible]	105	4,535
1893...........	2,371	3,043	157	5,257
1894...........	2,670	3,706	32	6,344
1895...........	2,375	4,350	84	6,641
1896...........	2,542	4,509	83	6,968
1897...........	2,980	5,032	222	7,790
1898...........	3,230	5,028	462	7,796
1899...........	3,032	6,306	1,355	[illegible]
1900...........	2,797	6,224	676	8,345
1901...........	3,453	[illegible]	[illegible]	9,365
1902...........	3,500	[illegible]	[illegible]	10,355

MISCELLANEOUS EUROPEAN COPPER TRADE.

Sweden, Norway, Denmark, Switzerland, Spain, Portugal and Balkan states.

(Not including Spanish and Portuguese Production.

(Compiled by Metallgesellschaft & Metallurgische Gesellschaft A.-G.)

(*Metric Tons.*

Year.	Production.	Imports.	Exports.	Consumption.
1892..........	1,400	1,100	800	1,700
1893..........	1,600	1,400	1,000	2,000
1894..........	1,600	1,400	700	2,100
1895..........	1,500	1,400	1,100	1,800
1896..........	1,700	1,400	800	2,300
1897..........	1,700	1,500	1,200	2,000
1898..........	1,500	1,700	1,500	1,700
1899..........	2,300	1,800	2,100	2,000
1900..........	2,500	1,600	2,100	2,000
1901..........	3,100	2,200	2,700	2,600
1902..........	9,900	2,700	9,700	2,900

WORLD'S PRODUCTION OF RAW COPPER.

1895–1902.

The following table, prepared by the Metallegesellschaft & Metallurgische Gesellschaft A.-G., includes in the figures of production for each country the copper estimated to have been actually produced from native and imported ores, from impure raw copper brought in for refining, and from imported refined raw copper.

(*Metric Tons.*)

Country.	1895	1897	1898	1899	1900	1901	1902
United States	170,100	224,800	242,900	270,100	277,000	281,600	341,100
Great Britain	78,246	75,000	69,500	79,100	80,000	80,000	66,500
Germany	25,777	29,408	30,695	34,634	30,929	31,376	30,591
France	8,245	7,400	7,834	6,600	6,400	6,500	7,300
Austria-Hungary	1,276	1,426	1,343	1,479	1,200	1,350	1,350
Italy	2,375	2,980	3,230	3,032	2,797	3,000	3,500
Russia	5,854	6,941	7,291	7,533	8,100	8,100	8,800
Sweden & Norway	1,500	1,700	1,500	2,300	2,500	3,200	9,900
Chile	19,600	18,000	18,000	17,100	19,800	23,400	22,300
Japan	11,500	11,300	12,400	21,000	19,300	20,900	14,400
Australia	8,100	10,400	14,700	16,800	17,400	19,900	18,400
Japan & Australia. Asiatic consumption	8,000	14,100	13,700	9,000	10,100	8,000	15,500
Mexico, Canada etc	10,900	15,500	7,300	9,300	9,300	12,200	10,000
Totals	351,473	418,955	430,393	477,978	484,826	499,526	532,700

WORLD'S CONSUMPTION OF RAW COPPER.

1895–1902.

(Compiled by Metallegesellschaft & Metallurgische Gesellschaft A.-G.)

(*Metric Tons.*)

Country.	1895.	1897.	1898.	1899.	1900.	1901.	1902.
United States	118,835	105,998	123,925	188,887	153,900	221,000	203,225
Great Britain	91,551	109,531	104,373	86,528	108,782	105,243	120,576
Germany	63,813	89,798	97,014	97,664	108,927	84,905	101,963
France	38,174	51,869	49,552	49,233	52,626	42,600	52,909
Austria-Hungary	12,872	17,193	18,612	17,130	19,699	18,358	19,170
Russia	14,000	19,500	17,500	13,800	14,200	14,100	17,500
Italy	6,641	7,790	7,796	7,683	8,345	8,882	10,385
Belgium	5,000	6,200	5,800	5,500	6,250	6,500	6,700
Netherlands	2,400	2,400	2,400	2,400	2,400	2,400	2,400
Misc. European	1,800	2,000	1,700	2,000	2,000	2,600	2,900
Eastern Asia	8,000	14,100	13,700	9,000	10,100	8,000	15,500
Miscellaneous	700	800	1,200	900	800	900	1,100
Totals	364,486	427,579	443,922	481,025	488,329	515,788	556,000

MONTHLY PRICES OF LAKE SUPERIOR INGOT COPPER.

(*January–June.*)

Year.	January.		February.		March.		April.		May.		June.	
	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.
1860....	24	23½	24	23⅝	23¾	23	23½	23	23½	22¾	22½	21¾
1861....	20	19	19½	19	19½	19½	19¾	19	19¾	19¼	19	18
1862....	28	27	28	25	25	23	23	21½	21¾	20½	23	20¾
1863....	35	31	37	35	37	31	31	30	30½	30	30½	30
1864....	41¼	39	42	41¼	42½	41½	44	42½	44	43	49	44
1865....	50½	46	46	44	44½	34	35	34	34	30	30½	28½
1866....	42	38	38	35½	35½	29½	30	28½	31	29	33	31
1867....	29¼	27	27¾	27½	27½	24	24½	23½	24½	24	24½	24
1868....	23½	21½	24	22½	24	23¼	24¼	23¼	24¼	24	24	23½
1869....	26¼	23¾	27	26	26¾	24	24	23¼	24¼	23¾	23¾	22
1870....	22	21⅜	21½	20¾	20¾	19	19¾	19½	19½	19	20⅝	19
1871....	22⅞	22	22⅜	21⅞	22	21½	21¾	21¼	21¾	21⅜	21½	21¼
1872....	28½	27⅝	28⅜	28¼	30½	28¾	44	30½	42	36	34¾	33
1873....	35	32½	35	34	35	34½	34½	30½	33½	32	31½	29½
1874....	25	24½	25	24⅛	24¾	24	25	24¾	25	24½	24¾	24¼
1875....	23½	21½	22¾	21¾	21¾	21½	21¾	21½	23¼	22⅝	23	23
1876....	23¼	23	22⅞	22½	22¼	22	22⅝	22	22¼	21	21	19¾
1877....	19½	19	20½	19½	19½	19	19½	19¼	19¼	19	19⅝	19
1878....	17⅝	17¼	17½	17⅛	17⅛	16⅞	17	16½	16¾	16¼	16⅝	16¼
1879....	16	15½	15½	15½	15¾	15¾	16	15¾	16⅛	16	16¼	16⅛
1880....	25	21⅝	24½	24	24	22¾	22½	21	21	18	18½	17⅞
1881....	19⅜	19⅝	19⅜	19⅛	19⅜	19	19	18¾	18⅝	18¼	18¼	16⅞
1882....	20⅝	20¼	20	19	19¼	18⅞	18⅞	17⅞	18¼	18	18¼	18
1883....	18⅛	18	17⅞	17¾	17⅝	17⅛	16	15¾	16	15⅞	15⅞	15
1884....	15	14⅞	15	14⅞	15	14⅞	15	14½	14¼	14⅛	14¼	14
1885....	11½	10⅝	11⅞	10⅛	11⅛	10⅝	11¼	10 1/10	11½	10⅝	11½	11
1886....	11⅝	11⅜	11⅝	11⅜	11½	11⅜	11½	11⅝	11⅛	10	10⅕	10
1887....	12	11⅛	11⅛	10⅕	10½	10⅝	10⅕	10	10	9 19/20	10¼	10
1888....	17⅜	15 17/20	16 8/10	16	16 7/20	15 19/20	16 9/10	16	16¾	16 7/10	16½	16 9/10
1889....	17½	16½	16¾	16½	15¾	15	16	15½	12⅛	12	12 13/40	12
1890....	14½	14¼	14¼	14¼	14¼	14	14½	14¼	15¼	14⅗	16¾	15¼
1891....	15	14⅝	14⅞	14¼	14¼	13⅝	13¾	13½	13¾	12¾	13	12⅞
1892....	11	10¾	10¾	10½	12	10¾	12	11¾	12¼	12	11⅞	11½
1893....	12½	12¼	12¼	12	12	11¾	11½	11¼	11⅛	11	11	10¾
1894....	10¼	10	10	9⅝	9⅝	9⅜	9½	9⅜	9⅜	9¼	9⅛	9
1895....	10	9⅞	9⅞	9½	9½	9¼	9¾	9⅜	10⅝	9¾	10¼	10½
1896....	10⅛	9¾	11¼	10	11¼	10⅞	11	10¾	11½	10⅞	11¾	11½
1897....	12	11½	12	11	11⅞	11½	11½	11	11⅛	10¾	11⅛	10⅞
1898....	11	10 9/10	11¾	11⅞	12	11⅞	12⅛	11⅞	12⅛	12	11⅞	11¾
1899....	17	13¼	18½	17	18	17¼	19⅝	18	19¼	18½	18½	17⅞
1900....	16½	16¼	16½	16	17	16¼	17¾	17	17⅝	16½	16½	16¼
1901....	17	17	17	17	17	17	17	17	17	17	17	17
1902....	11	13	12¼	13½	12¼	12½	12	12½	12	12¾	12¼	12⅝
1903...	12¾	12¼	13½	12¾	15⅜	13¾	15⅛	14¾	15¼	14¾	15¼	14

MONTHLY PRICES OF LAKE SUPERIOR INGOT COPPER.

(*July–December.*)

Year.	July.		August.		September.		October.		November.		December.	
	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.
1860....	21¾	21½	21½	21½	22	21¼	22	21½	21½	20¼	20¼	19¾
1861....	18	17½	19	17¾	20¼	19	20¼	20	22½	20¼	27	22½
1862....	24½	22½	24½	24	27	24¼	32⅞	27	32⅞	30½	31½	30½
1863....	32	29	31	29	32¼	31	34¼	32¼	38½	34½	38¾	38½
1864....	55	49	52½	50	52½	47½	48	47	49	47	50	48½
1865....	30¼	28	32	30½	32¾	31½	33	32½	45½	33	45½	39¼
1866....	33½	31	31	30	31½	30¾	31	30¾	30¾	26½	29	26½
1867....	26	24	26¼	25¾	27¼	26¼	26¾	22¾	23	22¾	23	21½
1868....	24½	23⅛	24¼	24	24	23¾	24	23	24	22½	24½	23¾
1869....	22¼	21⅞	23⅛	21⅞	23	22	22¾	22	22½	22	22	21½
1870....	20½	20⅜	21⅜	20⅜	21½	20¾	21¾	21½	23⅜	21¾	22⅝	22¼
1871....	22¼	21⅝	23	22⅜	22⅞	22⅞	23⅞	23¼	24¼	23¼	27	24½
1872....	34	33	35	32½	35¼	33	34¾	31¼	32¼	30¾	32½	30½
1873....	29	26⅝	27½	27	27	25½	25½	24	24	21	25	23
1874....	24¼	20	21	19	21¼	21	22¼	21¼	23¾	22¼	23¼	23¼
1875....	23	22⅝	23⅜	23	23⅞	23⅛	23¼	23	23¼	23	23⅜	23⅜
1876....	20	19½	19½	18¾	21	18¾	21¼	20½	20½	20	20	19⅝
1877....	19¼	19	19	17⅞	18½	17⅞	18	17¾	17¾	17⅝	17¾	17½
1878....	16¼	16	16	16	16¼	16	16	15½	15⅞	15½	16	15⅞
1879....	16⅛	16	16⅜	16	17	16¼	21½	18	21¾	21	21½	21
1880....	18⅞	18½	19⅛	19	18⅞	18¾	18⅞	18¾	18⅞	18¾	19⅛	18⅞
1881....	16½	16	16⅝	16⅜	18⅛	16¾	18⅜	18	19	18⅛	20⅜	19¼
1882....	18¼	18⅛	18¼	18⅛	18¼	18	18¼	18	18⅛	18	18	17⅞
1883....	15⅛	15	15	15	15¼	15⅛	15¼	15⅛	15	14⅞	15	14⅞
1884....	14⅛	13⅞	14	13⅞	13⅛	13	13⅛	12⅞	13	12½	12⅛	11
1885....	11¼	10⅞	11¼	11	11½	10 19/20	11⅛	10⅝	11⅛	10⅝	11½	11 1/10
1886....	10⅛	10	10¼	10	11⅛	10¼	11¾	11⅛	12	11¾	12⅛	11⅞
1887....	10¾	10⅛	10¾	10⅗	11	10⅝	12 3/20	10 3/10	14 19/20	11 11/20	17¾	14 19/20
1888....	16 9/10	16 13/20	17	16⅗	17 7/10	16 9/10	17⅗	17 7/20	17⅗	17¼	17 9/20	17 1/10
1889....	12	12	12	12	12	11	11	11	13¼	11¼	14½	14
1890....	17¼	16½	17¼	17	17	17	16⅞	16¾	16¾	16¾	16	15
1891....	12⅞	12½	12⅜	12	12½	12⅛	12⅝	11⅜	11½	11	11⅛	10¼
1892....	11¾	11¼	11¾	11⅗	11⅗	11 1/10	11¾	11 1/10	12	11¾	12⅗	12¼
1893....	10½	10¼	10½	9⅗	9⅞	9¾	9¾	9¾	10¼	9¾	10½	10⅜
1894....	9⅛	9	9⅛	9	9⅞	9⅛	9¾	9½	9½	9⅗	10	9½
1895....	11¾	10½	12¼	11¾	12¼	12	12	11¾	11⅝	11	11	10
1896 ...	11¾	11	11½	10⅞	10⅞	10⅜	10⅞	10½	11½	10⅞	11½	11¼
1897....	11⅛	11	11¼	11	11⅜	11¼	11¼	11	11	10¾	11	10⅞
1898....	11¾	11½	12⅛	11⅞	12¼	12⅛	11½	12¼	11¾	12½	12⅞	12⅝
1899....	18½	18¼	18¾	18½	18½	18¾	18½	17	17¼	17	17	16¼
1900....	16½	16⅛	16¾	16½	16⅞	16¾	16⅞	16¾	17	16¾	17	16¾
1901....	17	16¾	16¾	16¾	16¾	16¾	16 15/16	16¾	16 15/16	16 15/16	17	13
1902....	12	12½	11⅝	12⅛	11¾	12¼	11¾	12¼	11½	12	11⅝	12
1903...	14¼	13	13⅞	13	13¾	13¼	14	13	13¾	12¼	12⅝	12

AVERAGE HIGHEST AND LOWEST PRICES OF LAKE COPPER.

(Cents.)

Year.	Average Price.	Lowest Price.		Highest Price.	
1860...........	22⅞	19¾	Dec.	24	Jan.
1861...........	22¼	17½	July	27	Dec.
1862...........	21⅞	20¾	May	32⅞	Nov.
1863...........	33⅞	29	July	38¾	Dec.
1864...........	47	39	Jan.	55	July
1865...........	39¼	28	July	50½	Jan.
1866...........	34¼	26½	Nov.	42	Jan.
1867...........	25⅜	21½	Dec.	29¼	Jan.
1868...........	23	21½	Jan.	24½	Dec.
1869...........	24¼	21½	Dec.	27	Feb.
1870...........	21 3/16	19	Mch.	23⅜	Nov.
1871...........	24⅛	21¼	Apr.	27	Dec.
1872...........	35 9/16	27⅛	Jan.	44	Apr.
1873...........	28	21	Nov.	35	Jan.
1874...........	22	19	Aug.	25	Jan.
1875...........	22 11/16	21½	Jan.	23⅞	Sep.
1876...........	21	18¾	Aug.	23¼	Jan.
1877...........	19	17½	Dec.	20½	Feb.
1878...........	16 9/16	15½	Oct.	17⅝	Jan.
1879...........	18⅝	15½	Jan.	21¾	Nov.
1880...........	21 7/16	17⅞	June	25	Jan.
1881...........	18 3/16	16	July	20⅜	Dec.
1882...........	19⅛	17⅞	Apr.	20⅜	Jan.
1883...........	16½	14⅞	Nov.	18⅛	Jan.
1884...........	13	11	Dec.	15	Dec.
1885...........	10.67	9.8	May	11⅞	Feb.
1886...........	11 1/16	10	May	12⅛	Dec.
1887...........	13.85	9.95	May	17¾	Dec.
1888...........	16.78	15.85	Jan.	17.60	Nov.
1889...........	13.49	11	Sep.	17½	Jan.
1890...........	15.60	14	Mch.	17¼	July
1891...........	12.76	10¼	Dec.	15	Jan.
1892...........	11.56	10½	Feb.	12⅜	Dec.
1893...........	10.75	9.6	Aug.	12½	Jan.
1894...........	9.52	9	June	10¼	Jan.
1895...........	10.73	9⅜	Apr.	12¼	Aug.
1896...........	10.98	9¾	Jan.	12	June
1897...........	11.36	10¾	Nov.	12	Jan.
1898...........	12.05	11	Jan.	13¼	Dec.
1899...........	17.76	13¼	Jan.	19⅜	Apr.
1900...........	16.65	16	Feb.	17¼	Apr.
1901...........	16.72	13	Dec.	17	Jan.
1902...........	12.16	11	Jan.	13½	Feb.
1903...........	13.72	12	Dec.	15⅜	Mch.

AVERAGE AMERICAN AND ENGLISH PRICES.

The following table of average annual prices of copper in England and the United States is based upon the New York price for Lake copper and the London price for Standard copper. The last two columns give the American prices in cents and fractions and the English equivalent in sterling. English prices are for long tons of 2,240 pounds, and American prices for pounds avoirdupois, the last column, giving English equivalent of the American prices, being figured in long tons.

	English Prices.												American Prices.			
Year.	Lowest.			Highest.			Fluctuation.			Average.			Average	Average.		
	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.	Cents.	£	s.	d.
1880....	54	10	0	74	0	0	10	10	0	62	14	7	$21\frac{7}{16}$	99	0	8
1881....	57	0	0	72	10	0	15	10	0	61	16	9	$18\frac{3}{16}$	84	0	8
1882....	63	0	0	71	10	0	8	10	0	66	10	5	$19\frac{1}{8}$	88	6	11
1883....	57	0	0	67	10	0	9	10	0	62	17	11	$16\frac{1}{2}$	76	3	7
1884....	47	5	0	58	0	0	10	15	0	53	17	6	13	59	19	0
1885....	38	10	0	61	12	6	23	2	6	43	11	0	10.67	49	6	5
1886....	38	10	0	43	15	0	5	5	0	40	1	8	$11\frac{1}{16}$	51	1	10
1887....	38	7	6	85	5	0	46	17	6	46	0	6	13.85	64	0	0
1888....	73	0	0	105	0	0	32	0	0	81	11	3	16.78	77	10	1
1889....	35	0	0	80	0	0	45	0	0	49	14	8	13.49	62	6	5
1890....	46	10	0	61	12	6	15	2	6	54	5	3	15.60	72	1	10
1891....	44	1	3	56	10	0	12	8	9	51	9	4	12.76	58	19	1
1892....	43	10	0	47	18	9	4	8	9	45	13	2	11.56	53	8	4
1893....	40	12	6	46	16	3	6	3	9	43	15	6	10.75	49	13	10
1894....	37	17	6	43	0	0	5	2	6	40	7	4	9.52	44	0	0
1895....	38	13	9	47	8	9	8	15	0	42	19	7	10.73	49	12	0
1896....	40	10	0	50	8	9	9	18	9	46	18	1	10.98	50	14	9
1897....	47	0	0	51	15	0	4	15	0	49	2	6	11.36	52	10	2
1898....	49	5	0	57	8	9	8	3	9	51	16	7	12.05	55	13	10
1899....	58	1	3	79	2	6	21	1	3	73	13	9	17.76	82	0	11
1900....	70	14	2	78	7	1	7	12	11	73	12	6	16.65	76	18	2
1901....	47	0	0	72	17	6	25	17	6	66	19	8	16.72	77	4	7
1902....	47	10	0	56	15	0	9	5	0	52	11	5	12.16	56	3	8
1903....	53	13	7	64	0	7	10	7	0	58	3	2	13.72	63	4	8

TABLE FOR REDUCING ENGLISH INTO AMERICAN PRICES.

The following table shows the corresponding value in cents and fractions, per pound, of copper quoted at various prices from £35—the lowest quotation ever made—to £99 per long ton, exchange being figured on the basis of $4.85 as equal to one pound sterling:

£36....	7.79c.	£52....	11.25c.	£68....	14.72c.	£84....	18.18c.
£37....	8.01c.	£53....	11.47c.	£69....	14.93c.	£85....	18.40c.
£38....	8.22c.	£54....	11.69c.	£70....	15.15c.	£86....	18.62c.
£39....	8.44c.	£55....	11.90c.	£71....	15.37c.	£87....	18.83c.
£40....	8.66c.	£56....	12.12c.	£72....	15.58c.	£88....	19.05c.
£41....	8.87c.	£57....	12.34c.	£73....	15.80c.	£89....	19.27c.
£42....	9.09c.	£58....	12.55c.	£74....	16.02c.	£90....	19.48c.
£43....	9.31c.	£59....	12.77c.	£75....	16.23c.	£91....	19.70c.
£44....	9.52c.	£60....	12.99c.	£76....	16.45c.	£92....	19.92c.
£45....	9.74c.	£61....	13.20c.	£77....	16.67c.	£93....	20.13c.
£46....	9.95c.	£62....	13.42c.	£78....	16.88c.	£94....	20.35c.
£47....	10.17c.	£63....	13.64c.	£79....	17.10c.	£95....	20.56c.
£48....	10.39c.	£64....	13.85c.	£80....	17.32c.	£96....	20.78c.
£49....	10.60c.	£65....	14.07c.	£81....	17.53c.	£97....	21.00c.
£50....	10.82c.	£66....	14.29c.	£82....	17.75c.	£98....	21.21c.
£51....	11.04c.	£67....	14.50c.	£83....	17.97c.	£99....	21.43c.

PROPORTION OF COPPER TO TOTAL VALUE AMERICAN METAL PRODUCTION.

1888–1901.

Year.	Total Value Metallic Products.	Total Value of Copper Production.	Production of Copper in Pounds.	Percentage Copper Values.
1888	$253,731,822	$ 33,833,954	231,270,622	13.3
1889	267,247,033	26,907,809	231,246,214	10.0
1890	305,735,670	30,848,797	265,115,133	10.1
1891	300,232,798	38,455,300	295,812,076	12.1
1892	307,936,189	37,977,142	352,971,744	12.3
1893	250,207,406	32,054,601	339,785,972	12.8
1894	218,382,494	33,141,142	364,866,808	15.2
1895	282,149,808	38,682,347	392,639,964	13.8
1896	287,860,155	49,456,603	460,061,430	17.2
1897	302,531,147	54,080,180	494,078,274	17.9
1898	343,748,268	61,865,276	526,375,591	18.0
1899	525,797,557	101,222,712	581,319,091	19.0
1900	550,425,286	98,494,039	602,808,839	17.9
1901	524,873,284	86,629,266	601,499,886	16.5

LAKE SUPERIOR MINE DIVIDENDS.

TOTALS BY MINES, FOR ALL YEARS.

Company.	Condition.	First.	Last.	Total.	Amount.
Atlantic	*a*	1878	1901	18	$ 940,000
Cliff	*b*	1849	1867	37	2,518,620
Central	*b*	1864	1891	30	1,970,000
Copper Falls	*b*	1864	1871	3	100,000
Calumet	*c*	1870	1871	3	300,000
Calumet & Hecla	*a*	1871	1903	124	82,400,000
Champion	*a*	1903	1903	3	300,000
Franklin	*a*	1863	1894	21	1,240,000
Hecla	*c*	1869	1871	7	650,000
Kearsarge	*d*	1890	1897	3	160,000
Minnesota	*e*	1854	1876	19	1,820,000
National	*b*	1861	1872	9	320,000
Osceola	*a*	1878	1901	52	4,247,300
Pewabic	*f*	1862	1873	11	1,000,000
Phoenix	*a*	1877	1877	1	20,000
Quincy	*a*	1862	1903	75	14,470,000
Ridge	*g*	1873	1880	4	100,000
Tamarack	*a*	1888	1901	37	8,490,000
Trimountain	*a*	1903	1903	2	300,000
Wolverine	*a*	1898	1903	11	1,320,000
Totals				470	122,665,920

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a. Active.
b. Idle.
c. Absorbed by Calumet & Hecla.
d. Absorbed by Osceola.
e. Absorbed by Michigan.
f. Absorbed by Quincy.
g. Absorbed by Mass.

PRICES AND SALES OF AMERICAN COPPER SHARES.

1902–1903.

Company	1902.			1903.		
	Highest.	Lowest.	Sales.	Highest.	Lowest.	Sales.
Adventure	$ 24.75	$ 12.50	59,995	$ 18.00	$ 2.00	50,070
Allouez	4.75	2.25	24,990	7.50	3.13	152,262
Amalgamated	78.87	53.13	758,757	79.50	35.50	1,717,341
Anaconda	36.00	21.00	9,891	31.12	15.63	7,791
Arcadian	13.25	3.50	116,613	6.13	.75	92,842
Arnold	1.00	.50	4,070	.95	.25	4,582
Ashbed	.22	.20	150	....	....	....
Atlantic	21.00	36.00	24,119	15.00	7.00	34,087
Baltic	63.00	34.00	47,084	....	....	....
Bingham	39.75	20.50	99,650	39.00	20.00	126,200
British Columbia	10.50	5.00	8,425	7.50	2.50	2,018
Calumet & Hecla	650.00	420.00	4,357	550.00	400.00	5,371
Centennial	27.75	11.00	260,487	31.75	12.00	301,086
Copper Range	65.25	43.50	539,165	75.00	37.00	1,226,030
Daly-West	.....	.....	......	48.56	30.50	46,749
Elm River	5.50	1.50	87,317	5.38	2.00	67,078
Franklin	16.00	7.50	18,344	14.00	6.75	23,377
Granby	.....	.....	......	5.25	3.63	53,639
Isle Royale	25.00	9.00	43,083	17.50	5.00	44,485
Mass	21.50	12.50	112,645	18.00	3.00	65,717
Mayflower	3.63	1.50	28,719	2.50	.50	15,634
Michigan	13.25	7.00	38,645	11.50	4.50	29,087
Mohawk	49.00	27.00	120,238	58.00	31.00	120,526
Montreal & Boston	4.75	2.00	342,584	2.88	.55	88,432
National	3.75	1.00	2,800	1.25	.75	820
Old Colony	4.50	.85	17,101	2.50	.50	20,106
Old Dominion	30.00	14.25	68,864	23.50	3.75	119,849
Osceola	89.75	47.50	98,979	79.00	43.00	83,419
Parrot	35.00	21.00	26,392	34.00	16.00	59,512
Phœnix	5.00	3.25	16,820	7.50	2.75	23,522
Quincy	147.00	100.00	5,119	126.50	80.00	6,438
Rhode Island	3.25	1.25	20,318	3.75	.75	15,815
Santa Fe	4.00	1.00	69,484	3.00	1.00	42,370
Shannon	13.50	8.00	33,486	15.00	7.00	133,571
Tamarack	281.00	140.00	14,396	189.50	75.00	15,239
Tecumseh	3.50	.50	7,292	1.80	.40	7,505
Tennessee	18.50	10.75	1,984	33.00	17.25	11,030
Trimountain	125.00	31.50	71,455	106.50	70.00	41,930
Trinity	18.50	8.00	68,719	14.00	4.00	135,573
United Copper	35.00	19.00	10,214	32.75	4.00	6,520
Utah Cons	27.25	14.00	106,193	33.63	22.00	400,247
Victoria	6.75	3.00	54,642	9.00	1.50	52,925
Washington	1.50	.25	975	.50	.15	2,240
Winona	6.00	1.00	57,987	13.50	5.50	181,253
Wolverine	61.00	42.00	24,197	77.00	54.00	28,794
Wyandot	1.75	.75	15,342	2.88	.75	54,552

DIVIDENDS OF LAKE SUPERIOR MINES. (Continued.)

1873-1888.

	1873.	1874.	1875.	1876.
Minnesota	$	$	$	$ 10,000
Pewabic	[illegible]		....	....
Quincy	[illegible]	[illegible]	[illegible]	[illegible]
Central	[illegible]	[illegible]	[illegible]	[illegible]
Calumet & Hecla	[illegible]	[illegible]	[illegible]	[illegible]
Ridge	[illegible]	[illegible]	[illegible]	....
Totals	[illegible]	[illegible]	[illegible]	$1,570,000

	1877.	1878.	1879.	1880.
Cliff	$	$	$ [illegible]	$ ....
Quincy	[illegible]	[illegible]	[illegible]	220,000
Central	[illegible]	[illegible]	[illegible]	100,000
Calumet & Hecla	[illegible]	[illegible]	[illegible]	2,500,000
Ridge				10,000
Phoenix	[illegible]			....
Atlantic		[illegible]		40,000
Osceola		[illegible]	[illegible]	210,000
Totals	[illegible]	[illegible]	[illegible]	$3,080,000

	1881.	1882.	1883.	1884.
Quincy	$ [illegible]	$ [illegible]	$ 380,000	$ 280,000
Franklin	....	...		80,000
Central	[illegible]	50,000	60,000	40,000
Calumet & Hecla	2,000,000	2,000,000	2,000,000	800,000
Atlantic	....	80,000	80,000	40,000
Osceola	225,000	200,000	150,000	87,500
Totals	$2,665,000	$2,550,000	$2,670,000	$1,327,500

	1885.	1886.	1887.	1888.
Quincy	$ 180,000	$ 240,000	$ 200,000	$ 360,000
Franklin	40,000	80,000	40,000	120,000
Central	30,000	40,000	40,000	70,000
Calumet & Hecla	1,700,000	1,500,000	1,000,000	2,000,000
Atlantic	20,000	40,000	40,000	120,000
Osceola	....	....	50,000	150,000
Tamarack	....	....	....	440,000
Totals	$1,970,000	$1,900,000	$1,370,000	$3,260,000

DIVIDENDS OF LAKE SUPERIOR MINES. (Continued.)

1889-1903.

	1889.	1890.	1891.	1892.
Quincy	$ 280,000	$ 320,000	$ 450,000	$ 350,000
Franklin	80,000	80,000	80,000	160,000
Central	40,000	20,000	20,000	....
Calumet & Hecla	1,500,000	2,000,000	2,000,000	2,000,000
Atlantic	80,000	100,000	40,000	....
Osceola	50,000	225,000	150,000	150,000
Tamarack	640,000	590,000	800,000	600,000
Kearsarge	....	80,000	....	....
Totals	$2,670,000	$3,415,000	$3,540,000	$3,260,000

	1893.	1894.	1895.	1896.
Pewabic	$ 400,000	$	$ 140,000	$ ....
Quincy	300,000	400,000	600,000	1,000,000
Franklin	120,000	80,000	....	....
Calumet & Hecla	2,000,000	1,500,000	2,000,000	2,500,000
Osceola	100,000	....	100,000	125,000
Tamarack	600,000	400,000	400,000	360,000
Kearsarge	....	....	40,000	....
Totals	$3,520,000	$2,380,000	$3,280,000	$3,985,000

	1897.	1898.	1899.	1900.
Quincy	$ 800,000	$1,000,000	$ 950,000	$ 900,000
Calumet & Hecla	4,000,000	5,000,000	10,000,000	7,000,000
Atlantic	40,000	40,000	....	80,000
Osceola	191,000	277,250	558,450	571,200
Tamarack	360,000	480,000	600,000	1,020,000
Kearsarge	40,000	....	....	....
Wolverine	....	60,000	210,000	240,000
Totals	$5,431,000	$6,857,250	$12,318,450	$9,811,200

	1901.	1902.	1903.
Quincy	$ 900,000	$ 700,000	$ 550,000
Calumet & Hecla	4,500,000	2,500,000	3,500,000
Atlantic	80,000	....	....
Osceola	576,900	....	....
Tamarack	1,200,000	....	....
Wolverine	240,000	240,000	330,000
Champion	....	....	300,000
Trimountain	....	....	300,000
Totals	7,496,900	3,440,000	4,980,000

DIVIDENDS AND ASSESSMENTS OF LAKE SUPERIOR MINES.

Name of Company.	Total Assessments.	Total Dividends.	Credit Balance.	Debit Balance.
Adventure Cons.	$1,300,000	$	$ ..	$1,300,000
Albany & Boston	840,000		..	840,000
Allouez	1,916,000		....	1,916,000
Atlantic	[illegible]	[illegible]	..	40,000
Arcadian	1,800,000		.	1,800,000
Arnold	810,000		.	810,000
Aztec	150,000		. .	150,000
Baltic	1,800,000		..	1,800,000
[illegible]	1,300,000		.	1,300,000
Bohemian	180,000			180,000
[illegible]	140,000			140,000
Calumet & Hecla	1,200,000	[illegible]	[illegible]	......
Centennial Old	1,135,000			1,135,000
Centennial New	1,150,000			1,150,000
Central	[illegible]	1,970,000	1,870,000	....
Champion	2,500,000	300,000		2,200,000
Cliff	[illegible]	[illegible]	2,407,620	....
Conglomerate	1,300,000			1,300,000
Copper Falls	1,000,000	100,000		900,000
Copper Range	2,300,000	.		2,300,000
Delaware	2,000,000		.	2,000,000
Elm River	1,200,000			1,200,000
Evergreen Bluff ..	225,000			225,000
Flint Steel	264,000			264,000
Forest	180,000			180,000
Franklin .	220,000	1,240,000	1,020,000	....
Humboldt . .	120,000			120,000
Huron. . .	240,000		.	240,000
Indiana	200,000			200,000
Isle Royale	2,000,000			2,000,000
Kearsarge	180,000	160,000	.	20,000
Mass Cons.	1,700,000			1,700,000
Mayflower	800,000			800,000
Michigan .	1,600,000			1,600,000
Miners'.	2,000,000		.	2,000,000
Mohawk .	2,100,000			2,100,000
Minnesota. . .	456,000	1,820,000	1,364,000	....
National.. .	320,000	320,000	.	....
Nonesuch ..	400,000		. ..	400,000
Northwest . . .	283,000		.	283,000
Norwich	230,000		....	230,000
Ohio Trap Rock. .	150,000	.	...	150,000
Old Colony	1,100,000	. .	. . . . .	1,100,000
Osceola.	1,700,000	4,247,300	2,547,300	....
Pennsylvania	126,000		. . . .	126,000
Peninsula...	400,000	....	. ....	400,000
Pewabic....... .	585,200	1,000,000	414,800	....
Phœnix (Old)	1,037,500	20,000	....	1,017,500
Phœnix Cons.	1,100,000	....	....	1,100,000
Quincy............	200,000	14,470,000	14,270,000	....
Ridge.............	470,000	100,000	....	370,000
Rhode Island........	900,000	....	....	900,000
Tamarack...........	320,000	8,490,000	8,170,000	....
Tamarack Junior	640,000	... ...	....	640,000
Tecumseh	500,000	....	....	500,000

DIVIDENDS AND ASSESSMENTS OF LAKE SUPERIOR MINES.—Cont'd.

Name of Company.	Total Assessments.	Total Dividends.	Credit Balance.	Debit Balance.
Trimountain	1,900,000	300,000		1,600,000
Toltec	500,000			500,000
Victoria	1,000,000			1,000,000
Winona	1,000,000			1,000,000
Wolverine	230,000	1,320,000	1,090,000	
Wyandot	700,000			700,000
Totals	53,788,700	122,665,920	115,005,920	46,426,500
Balance			68,579,420	

CAPITALIZATION OF LAKE COPPER COMPANIES.

The following table shows number of shares authorized, number issued, and total capitalization of active Lake Superior copper mining corporations:

Name of Company.	Organized under laws of	No. shares authorized.	No. shares issued.	Gross Capitalization.
Adventure Cons.	Mich.	100,000	100,000	$2,500,000
Allouez	Mich.	100,000	100,000	2,500,000
Arcadian	N. J.	150,000	150,000	3,750,000
Arnold	Mich.	100,000	100,000	2,500,000
Atlantic	Mich.	100,000	100,000	2,500,000
Ashbed	Mich.	40,000	40,000	1,000,000
Calumet & Hecla	Mich.	100,000	100,000	2,500,000
Centennial	Mich.	100,000	90,000	2,500,000
Central	Mich.	20,000	20,000	500,000
Copper Range	Mich.	100,000	100,000	2,500,000
Copper Range Cons	N. J.	385,000		38,500,000
Champion	Mich.	100,000	100,000	2,500,000
Elm River	N. J.	100,000	100,000	2,500,000
Franklin	Mich.	100,000	100,000	2,500,000
Humboldt	Mich.	40,000	40,000	1,000,000
Isle Royale	N. J.	150,000	150,000	3,750,000
Mohawk	Mich.	100,000	100,000	2,500,000
Mayflower	Mich.	100,000	100,000	2,500,000
Mass Consolidated	Mich.	100,000	100,000	2,500,000
Michigan	Mich.	100,000	100,000	2,500,000
National	Mich.	100,000	40,000	2,500,000
Old Colony	Mich.	100,000	100,000	2,500,000
Osceola Consoldiated	Mich.	100,000	96,150	2,500,000
Phœnix	Mich.	100,000	100,000	2,500,000
Quincy	Mich.	100,000	100,000	2,500,000
Rhode Island	Mich.	100,000	100,000	2,500,000
St. Mary's Mineral Land Co.	N. J.	200,000	140,000	5,000,000
Tamarack	Mich.	60,000	60,000	1,500,000
Tecumseh	Mich.	100,000	40,000	2,500,000
Trimountain	Mich.	100,000	100,000	2,500,000
Union C. L. & M. Co	Mich.	100,000	80,000	2,500,000
Victoria	Mich.	100,000	100,000	2,500,000
Winona	Mich.	100,000	100,000	2,500,000
Washington	Mich.	100,000	60,000	2,500,000
Wolverine	Mich.	60,000	60,000	1,500,000
Wyandot	Mich.	100,000	100,000	2,500,000
Total capitalization				**$124,000,000**

FORCES EMPLOYED BY MINES.

	Michigan.			Montana.		
Year.	Number of Employes.	Number of Fatalities.	Percentage Fatalities.	Number of Employes.	Number of Fatalities.	Percentage Fatalities.
1889...	6,480	21	.30	....	..	...
1890...	7,310	35	.48	....	..	...
1891...	7,702	28	.36	....	..	...
1892...	7,640	21	.27	....	..	...
1893...	7,591	23	.30	....	..	...
1894...	7,348	22	.30	....	..	...
1895...	7,249	46	.63	....	..	...
1896...	8,170	19	.23	....	..	...
1897...	8,726	26	.30	....	..	...
1898...	10,469	23	.22	6,548	..	...
1899...	13,051	27	.20	6,932	..	...
1900...	13,971	36	.25	6,929	30	.43
1901...	13,498	33	.24	....	..	...
1902...	14,130	44	.31	8,100	33	.41
1903..	15,196	37	.24	....	..	...

NUMBER OF SHAREHOLDERS IN LAKE COPPER COMPANIES.

1896--1903.

Company.	1896.	1897.	1898.	1899.	1900.	1901.	1902.	1903.
Calumet & Hecla..	2,464	2,590	2,716	2,859	3,080	3,413	3,425	3,310
Osceola...........	823	900	1,177	1,522	1,512	1,793	1,985	1,988
Quincy...........	978	1,041	1,445	1,449	1,540	1,477	1,557	1,612
Franklin..........	458	461	442	550	945	1,037	1,311	1,438
Rhode Island......	....	....	...	97	1,100	1,256	1,216	1,316
Victoria..........	....	....	....	....	796	1,001	1,206	1,275
Wolverine.........	333	445	625	688	892	1,099	1,223	1,262
Tamarack.........	1,178	1,371	1,353	1,157	1,169	1,241	1,286	1,239
Adventure.........	....	....	....	431	1,046	1,288	1,050	1,089
Mohawk...........	....	....	....	61	594	940	951	1,001
Michigan..........	....	....	....	22	592	775	933	980
Winona...........	....	....	....	468	637	736	909	854
Old Colony........	....	....	....	....	598	626	721	746
Centennial........	....	....	438	337	439	550	597	630
Allouez...........	....	....	....	449	465	510	554	627
Phœnix...........	....	....	....	....	352	408	582	612
Mayflower.........	....	....	....	....	399	423	587	587
Elm River.........	....	....	....	....	....	....	....	506
Atlantic..........	364	400	401	300	374	408	417	457
Trimountain.......	....	....	....	....	780	882	730	335
Central...........	....	....	....	196	203	220	189	168
Baltic............	....	....	....	486	513	582	177	17
Copper Range......	....	....	....	....	....	....	121	11
Champion.........	....	....	....	....	....	....	8	8
Totals........	6,598	7,208	8,897	11,072	18,026	20,665	21,735	22,068

FUTURE PRODUCTION OF COPPER.

1901-2000.

The safest guide to the future is the history of the past. In the following tables an effort is made to estimate the probable production of copper for the future, basing such estimates upon the outputs of the past. The preliminary table next following gives a summary of the production of the Nineteenth Century, by decades, with percentages of increase for each decade:

(*Long Tons.*)

Decade.	Total Production.	Yearly Average.	Percentage of Increase.
1801-1810......	91,000	9,100	.....
1811-1820......	96,000	9,600	5.60
1821-1830......	135,000	13,500	40.62
1831-1840......	218,400	21,840	61.77
1841-1850......	291,000	29,100	33.24
1851-1860......	506,999	50,699	74.22
1861-1870......	900,000	90,000	77.51
1871-1880......	1,189,000	118,900	32.11
1881-1890......	2,373,398	237,339	99.44
1891-1900......	3,708,901	370,890	56.22

Analysis of these figures shows that the average decennial percentage of increase for the century was 53.91%; for the last half of the century, 67.90%, and for the last twenty years, during which the electrical industry became a great consumer of copper, the average decennial increase in copper output was 77.83%. Measured by decades the increase in copper production during the Nineteenth Century was forty-fold, from the first decennium to the last, while measured by years, and estimating the production of 1801 at 9,000 tons, the production of 1900, which amounted to 486,363 tons, was just fifty-fold as great as one hundred years earlier. A fifty-fold increase in production during the present century would give an output of 24,318,150 tons of copper for the year 2000.

The actual annual percentage of increase for the Nineteenth Century was a very small fraction more than 4%, measuring outputs by decades, and a fraction over 4%, measuring annual products from 1801 to 1900, inclusive. In order to show the actual increase in production by decades, as compared with the theoretical increase at 4% yearly, the appended table is given, 4% being figured as equal to 50% increase in 10 years, though actually but 48.02%.

(*Long Tons.*)

Year.	Actual Average.	Theoretical Average.
1810......................	9,100	9,000
1820......................	9,600	13,500
1830......................	13,500	19,750
1840......................	21,840	29,625
1850......................	29,100	44,437
1860......................	50,699	66,656
1870......................	90,000	99,984
1880......................	118,900	149,992
1890......................	237,339	224,964
1900......................	370,890	337,447

The foregoing table shows very plainly the effect of electrical demand for the metal, which first became a factor of importançe in the ninth decade, shortly after 1880. Previous to that decade the theoretical increase of 4% annually, compounded, exceeds the actual increase in every decade, but after 1880 the actual increase exceeds the theoretical ratio. The actual copper output of 1900 was 486,732 tons, and the theoretical output for that year, based on the average of the decade 1890-1900, with 21⅝% increase for 5 years from the mean of 1895, would have been 410,560 tons. It is evident that the average ratio of increase of slightly more than 4% yearly, which ruled during the Nineteenth Century, is not the factor of the present electrical age. What that factor may be is uncertain. The electrification of the globe, while wonderful progress has been made, is not yet a sufficiently established fact to give accurate data for an average ratio of increase in consumption.

The ratio of increase in copper production of the world has been 6% to 8% for several years past. It has grown to be considered an axiom in the copper trade that the normal increase is 8% yearly, but this ratio, while it may be considered the present factor, has not been established for a sufficiently long time to be assured for an indefinite time in the future. The following table gives hypothetical outputs for every tenth year during the Twentieth Century, based upon various percentages of increase, all figured from the actual production of the closing year of the Nineteenth Century. The compound increases, for facility in computation, are taken at slight changes from their actual value, as, for instance, 4% compounded for ten years is figured as 50% increase, instead of 48.02%, the actual figure; 5% is figured at 60%, instead of 62.89%; 7% compounded is figured as 80% in ten years, instead of 79.02%; 8% is figured as only 110% instead of 115.89.

(*Long Tons.*)

Year.	At 4%.	At 5%.	At 7%.	At 8%.
1900......	486,732	486,732	486,732	486,732
1910......	730,098	778,771	876,117	1,022,137
1920......	1,095,147	1,246,033	1,577,011	2,146,488
1930......	1,642,720	1,993,654	2,838,621	4,507,625
1940......	2,464,080	3,189,846	5,126,317	9,466,012
1950......	3,696,121	5,103,754	9,227,372	19,878,626
1960......	5,544,181	8,166,007	16,609,269	41,745,115
1970......	8,316,272	13,065,612	29,896,685	87,664,741
1980......	12,474,408	20,904,980	53,914,033	184,095,956
1990......	18,711,613	33,447,968	97,045,260	386,601,507
2000......	28,067,419	52,516,748	174,681,468	811,863,165

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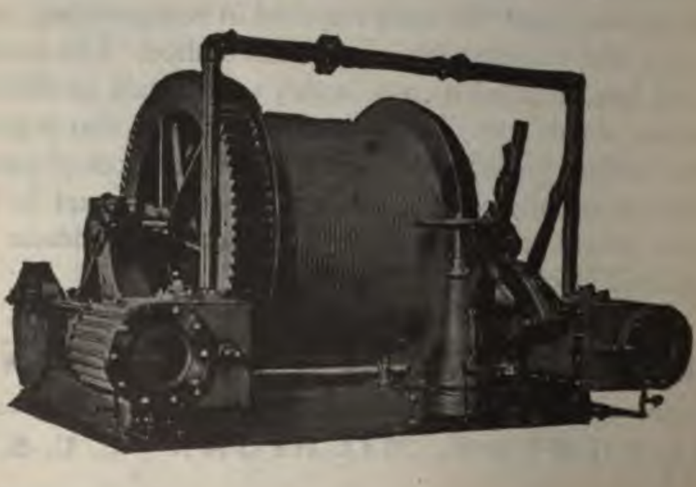

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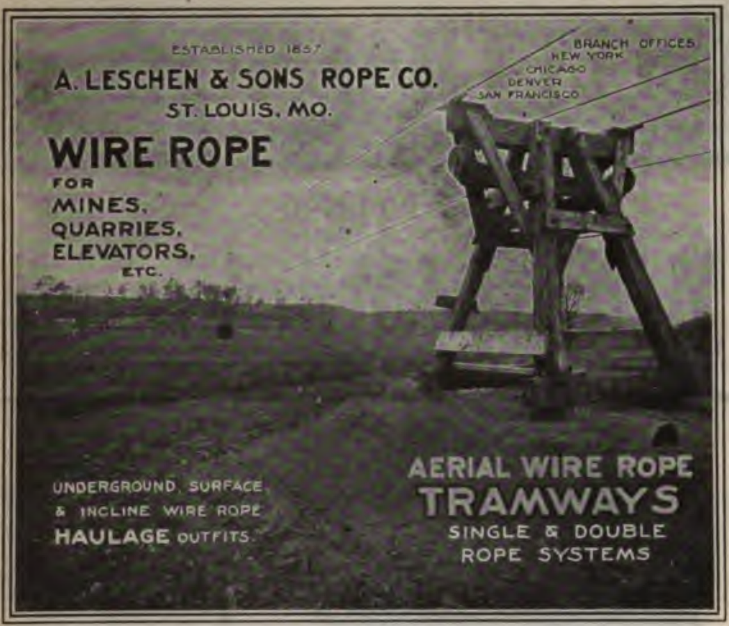

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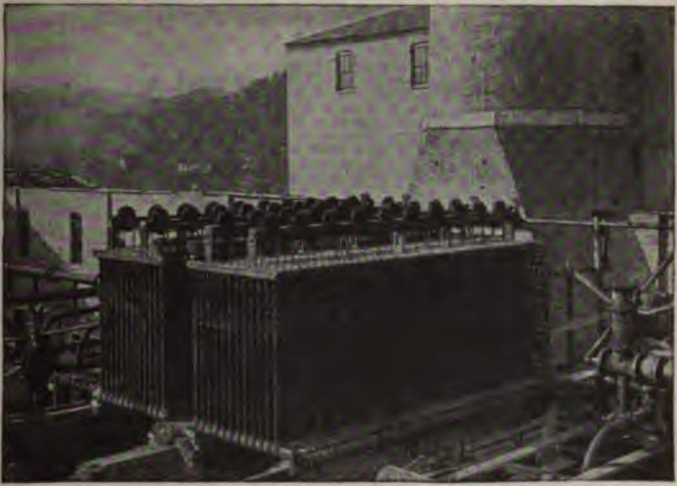

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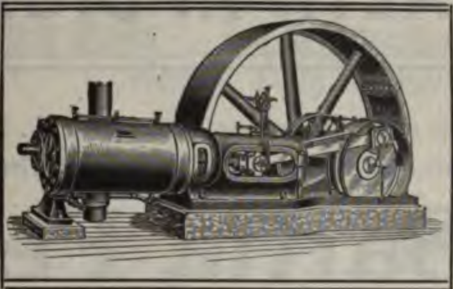

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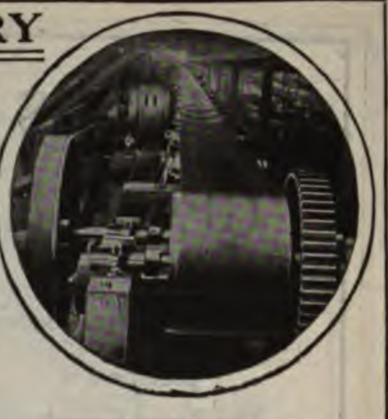

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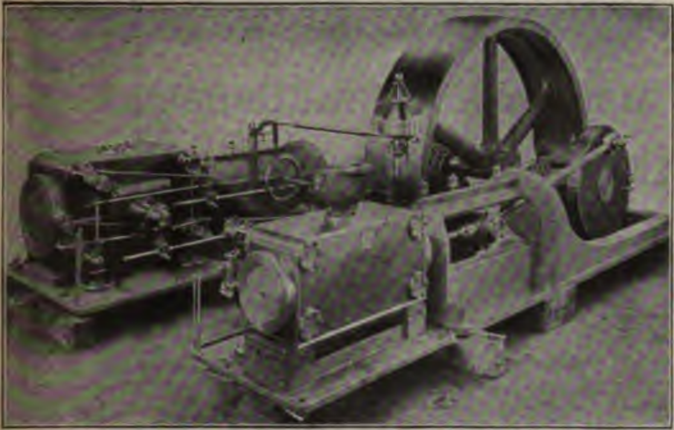

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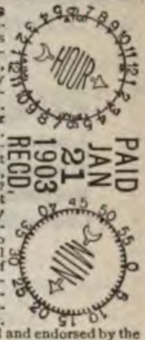

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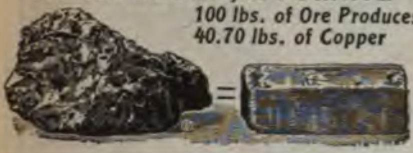

Here is a record of some recent shipments

Date	Gross Pounds	Per Ton	Per ct. Copper	Value
Dec. 31, 1900	43,201	$123.42	51.23	$2,359.36
Jan. 15, 1901	43,505	109.69	46.00	2,183.21
Feb. 12, 1901	44,748	86.30	36.84	1,732.95
Feb. 28, 1901	39,884	93.98	39.39	1,714.85
Mch. 22, 1901	46,160	103.19	42.00	2,316.15
April 3, 1901	43,760	95.97	39.80	2,052.56
April 8, 1901	45,034	97.17	49.15	2,094.98
May 3,1901	62,627	97.26	40.65	2,923.73
May 3, 1901	38,629	100.71	41.64	1,891.69
July 27, 1901	35,600	78.40	33.29	1,406.03
Aug. 15, 1901	48,850	91.55	38.17	2,146.66
Sept. 15,1901	27,067	94.52	39.40	1,279.19

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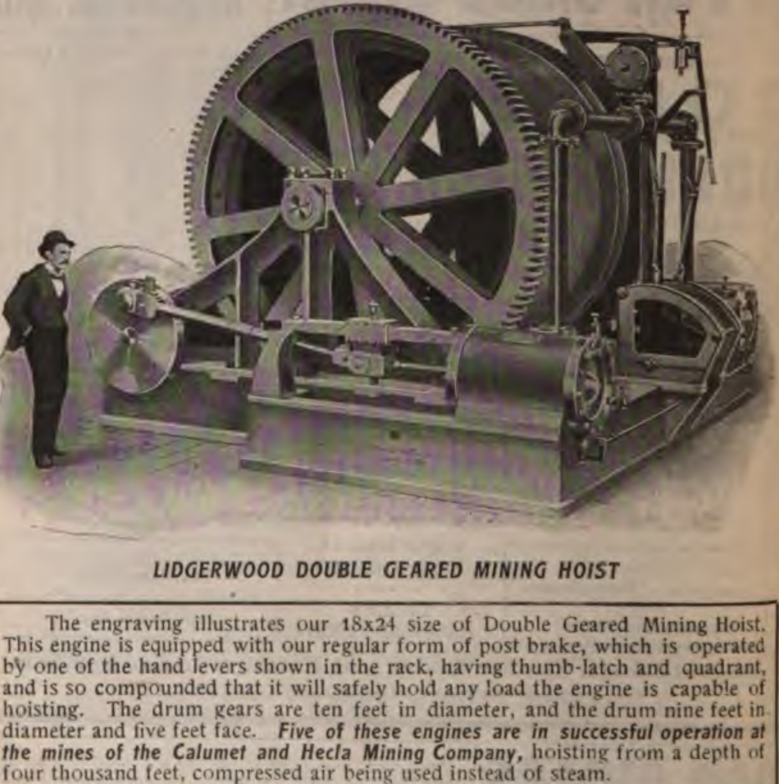

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